A REVIEW OF SOFTWARE OPPORTUNITIES IN THE COMPUTER SERVICES INDUSTRY

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Formed in 1974, INPUT has become a leading international consulting firm. Clients include over 100 of the world's largest and most technically advanced companies.

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IN THE
COMPUTER SERVICES INDUSTRY
PHASE I

Prepared for:
FORD AEROSPACE & COMMUNICATIONS CORP.

JANUARY 1982

A REVIEW OF SOFTWARE OPPORTUNITIES IN THE COMPUTER SERVICES INDUSTRY
PHASE I

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I INTRODUCTION

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I INTRODUCTION

A. BACKGROUND

- INPUT has been engaged by Ford Aerospace & Communications (FACC) to assist it in one portion of its business planning: evaluating whether it should enter the software business and, if so, in what way.

- The FACC approach is to address the issues in three phases.

- During Phase I, the extent of the market opportunity will be evaluated and Ford Aerospace will decide whether to enter the market. INPUT's contribution to Phase I is:

  - To analyze the software industry and make a presentation to FACC management on general market size, trends, and issues.

    - This was completed on December 17, 1981.

  - To prepare a written report based on the presentation and feedback during and after the meeting, outlining the status and future of the software industry.

    - That is the subject of this report.

  - INPUT will make a presentation to Ford Aerospace's top management summarizing the opportunities, the alternatives for entry, and the risks and rewards of different market strategies.

    - This is scheduled for March 3, 1982.

- In Phase II different market entry strategies will be evaluated.

  - The basic questions will be:

    - Timing.

    - Target markets and products.

    - Resource commitment.

    - Internal development versus acquisition.

    - Acquisition strategy (if applicable).

  - INPUT can assist Ford Aerospace in this phase by:

    - Helping to establish goals and objectives.

    - Assessing people, and organizational and product capabilities within Ford Aerospace.

    - Assessing market needs.

    - Recommending an entry and acquisition strategy.

    - Assisting in business planning.

- Phase III will involve actual market entry.

- This will include:
    - Product development.
    - Marketing planning.
    - Acquisition selection, evaluation, and integration.
- INPUT can assist in any or all of the above (although INPUT does not involve itself in the actual acquisition selection and negotiation process to eliminate potential conflicts of interest).

B. THE STRUCTURE OF THE COMPUTER SERVICES BUSINESS

- The computer services business includes the following components which are defined in more detail later in this section.
    - Processing services.
    - Software products.
    - Professional services.

1. PROCESSING SERVICES

- These encompass facilities management, remote computing services, and batch services.
    - Batch Services - This includes data processing performed at vendors' sites of user programs and/or data which are physically transported (as opposed to electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as keypunching

and Computer Output Microfilm (COM) processing, are also included. Batch services include those expenditures by users that take their data to a vendor site which has a terminal connected to a remote computer used for the actual processing.

- Remote Computing Services - Provision of data processing to a user by means of terminals at the user's site(s) connected by a data communications network to the vendor's central computer.

- Uses of processing services are:

  . Problem Solving And Data Base Management Services - Based on software tools designed to manage user data bases and/or convert data into usable information through the use of mathematical, statistical, or financial analysis tools. These tools usually enable the end user to readily and easily display the results in report or graphical form.

  . Transaction Processing Services - Usually highly repetitive, clerical applications. Most business accounting fits into this category: payroll, accounts receivable, order entry, portfolio accounting, and inventory control are all good examples of transaction processing. Many industry-specific applications also fit into this category; for example, wholesale distribution and most hospital processing services.

  . Vendor Data Base Services - Based on data bases supplied by the vendor. Although the data base may be public or owned by a third party, the vendor controls access to it. Credit authorization and legal data bases are examples.

  . Utility Services - Provision of access to a computer and/or communications network with basic software that enables users to develop their own program. Terminal-handling software, sorts, language compilers, scientific library routines, and other systems software, including language, are included in this category.

2. SOFTWARE PRODUCTS

- This category includes users' purchases of applications and systems packages for use on in-house computer systems. Included are lease and purchase expenditures, as well as fees for work performed by the vendor to implement and maintain the package at the users' sites. Fees for work performed by organizations other than the package vendor are counted in professional services. There are several subcategories of software products.

  - Applications Products - are software which perform processing to service user functions. They consist of:

    - Cross-Industry Products - which are used in multiple user industry sectors. Examples are payroll, inventory control, and financial planning.

    - Industry-Specialized Products - which are used in a specific industry sector such as banking and finance, transportation, or discrete manufacturing. Examples are demand deposit accounting and airline scheduling.

  - Systems Products - are software which enables the computer/communications system to perform basic functions. They consist of:

    - Systems Operations Products - which function during applications program execution to manage the computer system resource. Examples include operating systems, DBMS, communication monitors, emulators, and spoolers.

    - Systems Utilization Products - which are used by operations personnel to utilize the computer system more effectively. Examples include performance measurement, job accounting, computer operations scheduling, and utilities.

    - Systems Implementation Products - which are used to prepare applications for execution by assisting in designing, programming, testing, and related functions. Examples include languages, sorts, productivity aids, data dictionaries, report writers, project control systems, program library management systems, and retrieval systems.

3. PROFESSIONAL SERVICES

- This category is made up of services related to EDP, including systems design, custom/contract programming, consulting, education, training, and facilities management.

  - Services are provided on the basis of:

    - Time and Materials - The billing rate is measured in units of time rather than actual costs.

    - Fixed Price - A firm price is agreed upon for a defined piece of work.

    - Cost Plus Fee - The billing rate depends on actual costs plus a fixed fee.

  - Services are sold to:

    - Government - which includes federal, state, and local governments and their agencies.

        - Commercial - which includes all nongovernment organizations.

    - Facilities Management (FM) - (Also referred to as "Resource Management" or "Systems Management.") The management of all or part of a user's data processing functions under a long-term contract (not less than one year). To qualify as FM, the contractor must directly plan and control as well as operate the facility provided to the user on-site, through communications lines or mixed mode. Simply providing resources, even though under a long-term contract and/or for all of a user's processing needs, does not necessarily qualify as FM.

- Note: Much of military electronics consists of computer-based components embedded in weapons and communication systems. The development of associated software would usually fall into the professional services category above.

    - At points in the report the contrast will be made between the DOD and non-DOD marketplace.

C. THE SCOPE OF THIS REPORT

- This report will focus on:

    - The "business" software market (including non-DOD government applications).

    - Professional services which deal in custom software.

        - Where data are available, the DOD and non-DOD markets will be compared.

    - Unless otherwise specified, DOD data come from Electronic Industry Association (EIA) studies and data.

- Processing services will be reported on to the extent necessary to give a complete picture of the industry.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

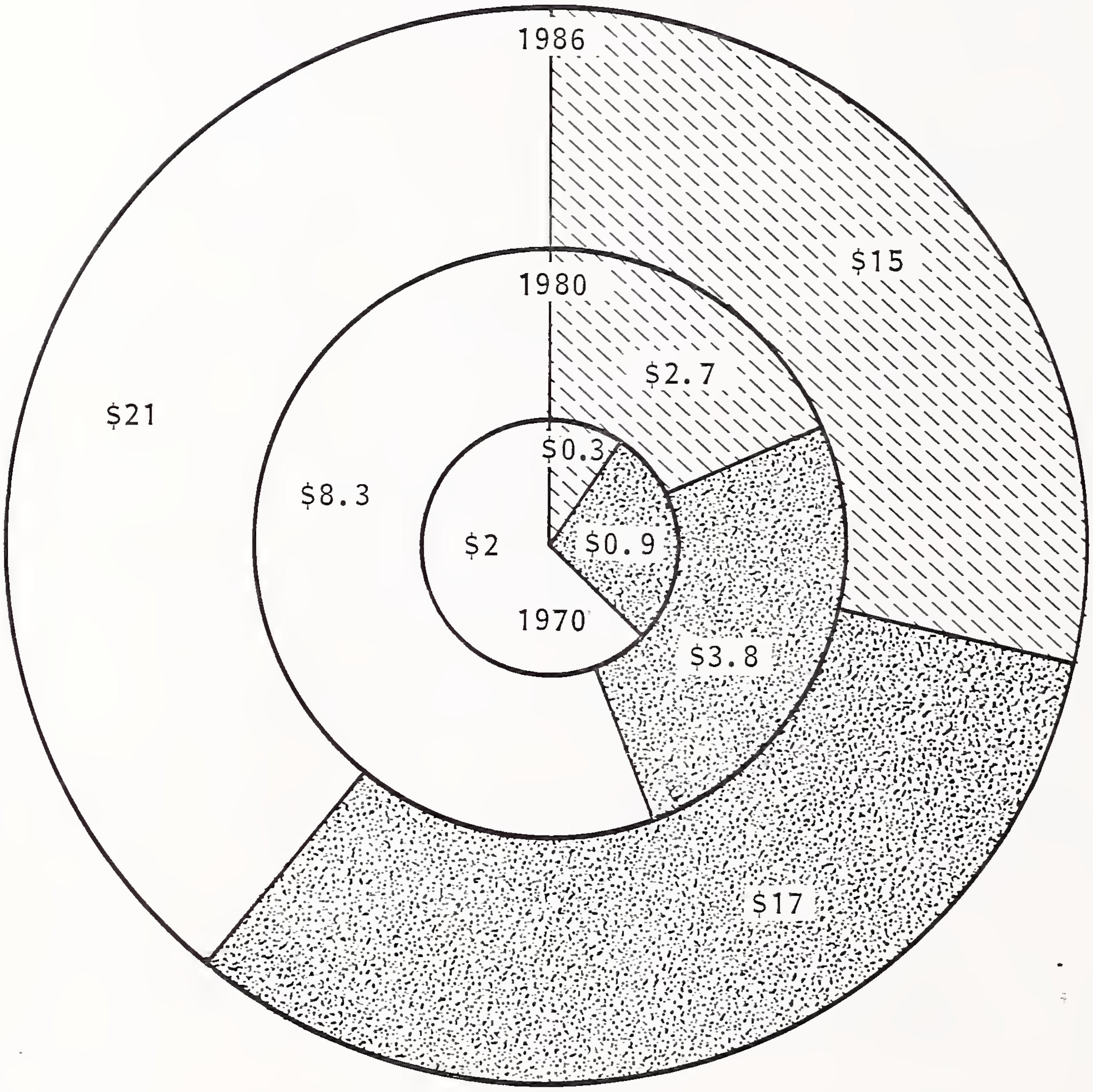
A. OVERVIEW

- The growth of the market for commercial computer services in the U.S. shows no sign of diminishing.
  - The 10 years from 1970 to 1980 saw growth of 17% annually.
  - From 1980 to 1986 the growth rate should increase to 24% annually.
- The composition of the growth is changing, however:
  - Software products will increase from 10% of the overall market in 1970 to 30% in 1986, as shown in Exhibit II-1.
  - The increase is almost exactly balanced by the decline in the proportion of processing services.
  - The proportion of professional services will remain fairly constant.
- This shifting balance between the three major sectors is also causing the distinctions between the three areas to blur as:
  - Software will be semi-customized and modularized.

EXHIBIT II-1

U.S. INFORMATION SERVICES MARKET, 1970-1986*

($ billions)



MARKET

1970 = $ 3.2 billion
1980 = $14.8 billion
1986 = $53.0 billion

▧ = Software Products

░ = Professional Services

□ = Processing Services

* Does not include embedded DOD software

  - There will be increased emphasis on specialized knowledge being delivered through a data base or consulting.

- The military software market is also a very attractive one. By far the largest and fastest growing area will be embedded software.

  - Embedded software is characterized by being:

    - Specially designed for a particular mission.

    - Acquired as part of a weapons package.

  - It shares characteristics of both software products and professional services in the commercial marketplace.

- The DOD embedded software market should grow 41% annually, from $2.8 billion in 1980 to $13.9 billion in 1986.

  - Both the size and growth rate compare favorably with the commercial market, as shown in Exhibit II-2.

- The development and distribution of software and services will undergo increasing changes during the 1980s.

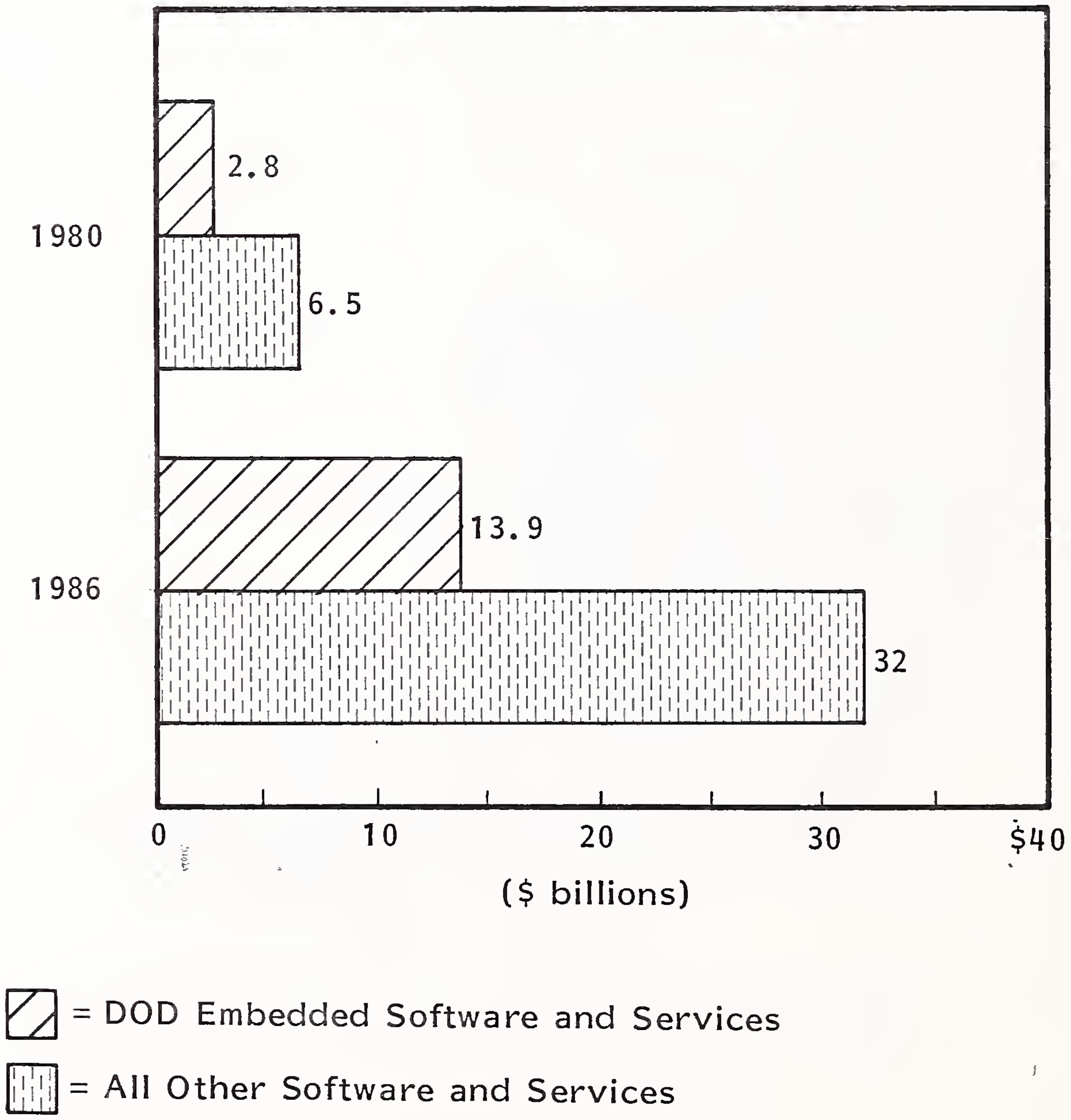
  - There will be a greater scarcity of skilled manpower and it will be more expensive.

  - These manpower pressures plus the need to construct more reliable software will force profound changes on the way software is produced.

    - This could provide significant opportunities for new entrants who do not have preconceived notions of how the business should be conducted.

EXHIBIT II-2

1980 AND 1986 SOFTWARE AND SERVICES MARKETS:
EMBEDDED VERSUS ALL OTHER



B. FACC OPPORTUNITIES

- It is important above all else that any FACC initiatives be carefully planned. This can have a significant impact on profits, as shown in Exhibit II-3.

- In INPUT's opinion, two of the most important factors to influence FACC in entering a particular market are:

  - The market's size and growth rate.

  - FACC's experience in the product and market area.

    - Additional experience could be gained by acquisition. However, it might be difficult for FACC to manage and integrate acquisitions that were in totally new areas.

    - Acquisitions made for investment only, where FACC would play a passive management role (and where little synergy was expected) would be in a different category.

- Given these criteria, the DOD embedded software market is by far the most attractive one to enter, as shown in Exhibit II-4.

EXHIBIT II-3

IMPACT OF PLANNING COMPUTER SERVICE VENTURES ON PROFITS

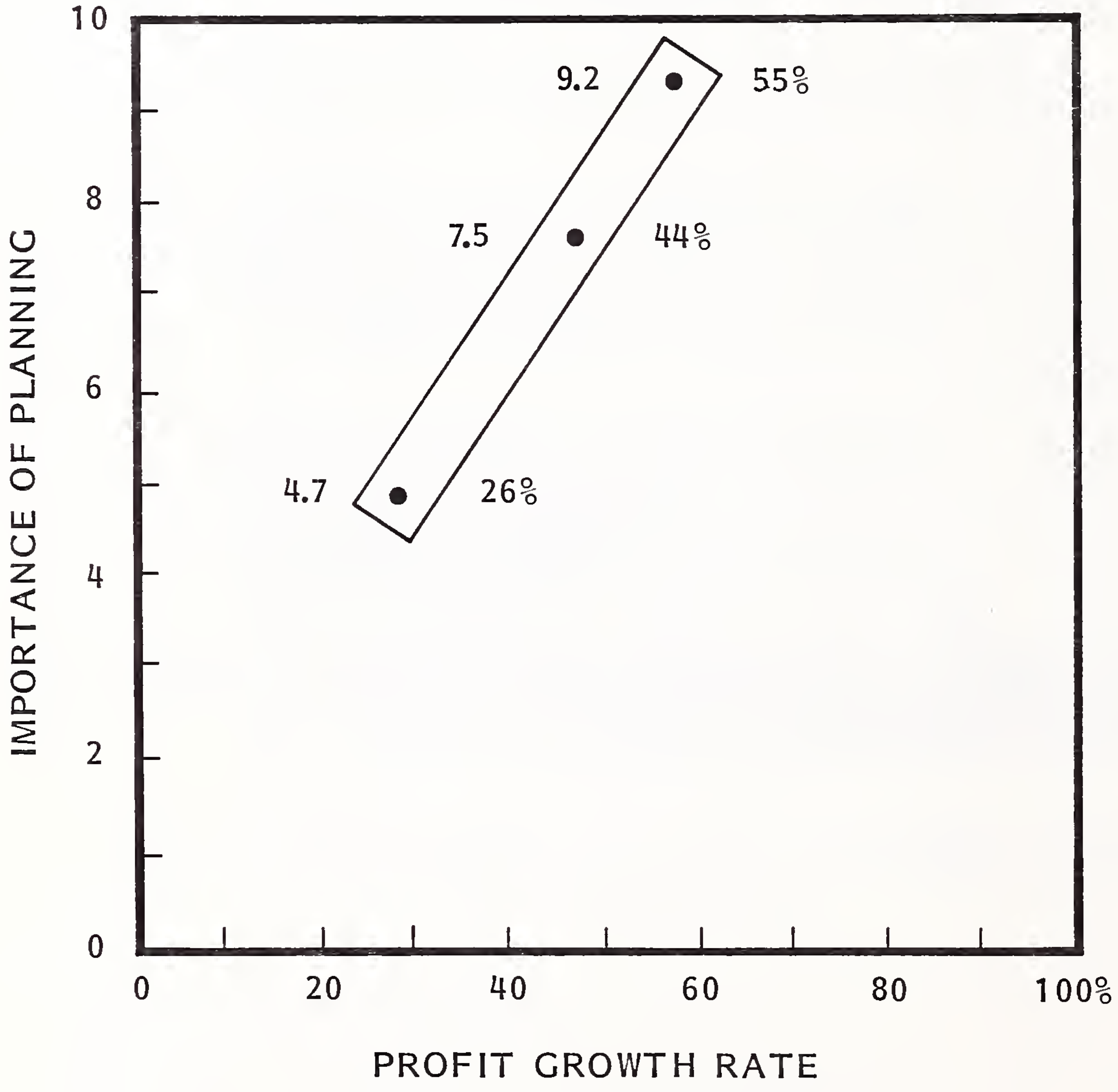
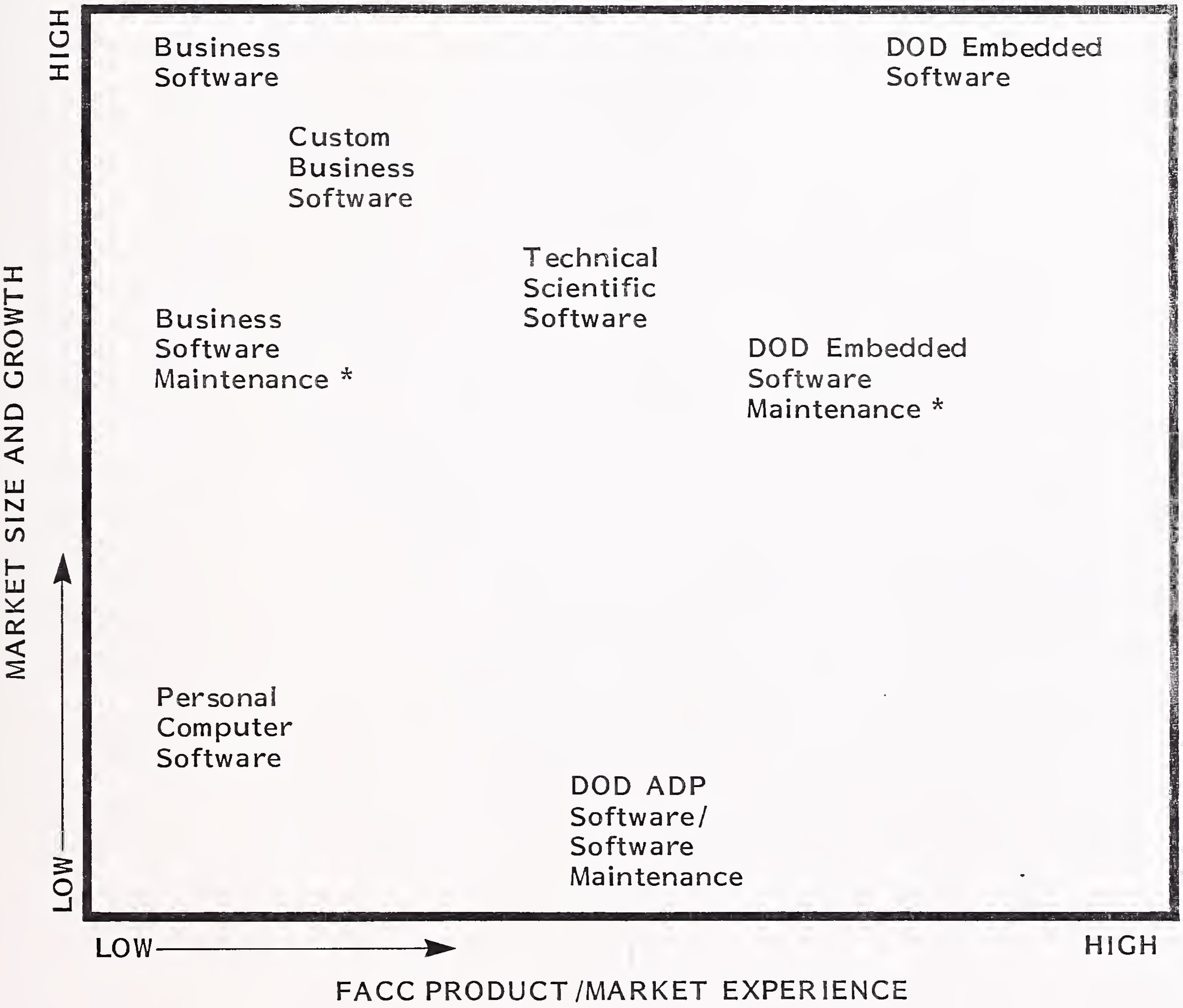


EXHIBIT II-4

RELATIVE ATTRACTIVENESS OF DIFFERENT OPPORTUNITIES



* Market Size and Growth Estimated;
Currently Being Studied

III THE STATE OF THE INDUSTRY

III THE STATE OF THE INDUSTRY

A. OVERVIEW

- The current U.S. information services market for non-embedded systems was almost $15 billion in 1980, as shown in Exhibit III-1.
    - Processing services accounted for over half of this, and software products for almost 20%.
    - This should be contrasted with the same market 10 years ago, as shown in Exhibit III-2.
        - It was only one-fifth the total size and software products accounted for only 11% of it.
- The size of the market for DOD software products and professional services is about 50% of the size of the analogous market for non-DOD software, as shown in Exhibit III-3.

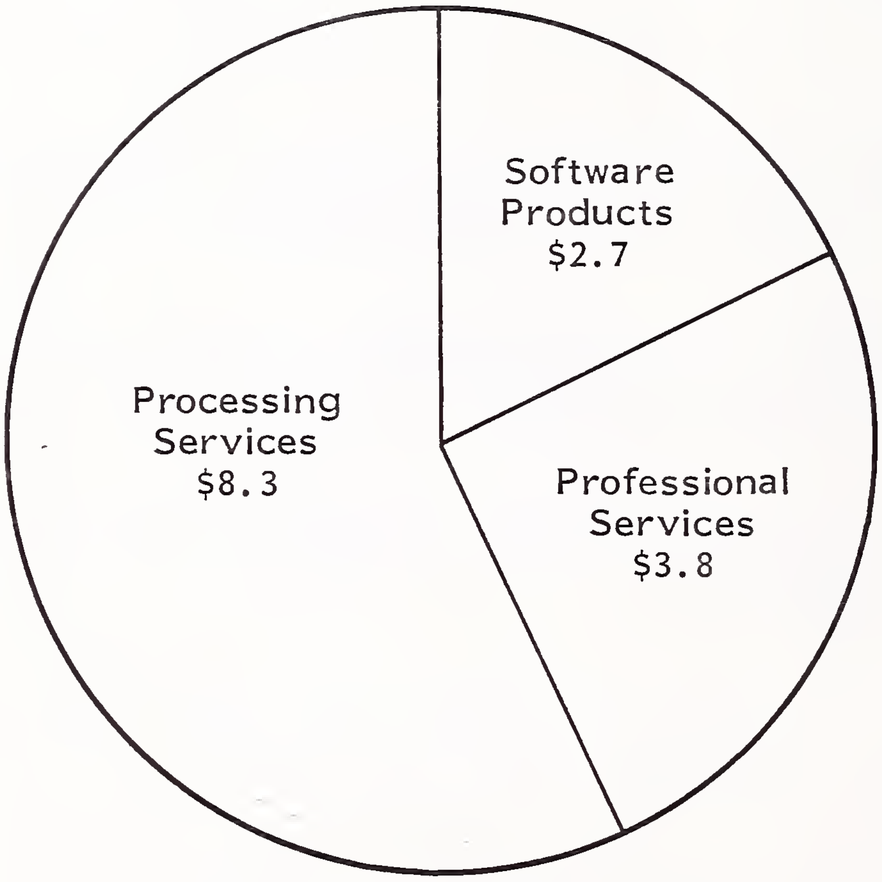
B. LEADING FIRMS' PERFORMANCE

- The leading publicly held firms in the industry averaged 27% growth in 1979 to 1980. (Note: Data does not include embedded software and services.) Their average profit was 12% in 1980, as shown in Exhibit III-4.

EXHIBIT III-1

U.S. INFORMATION SERVICES MARKET, 1980*

(current $ billions)



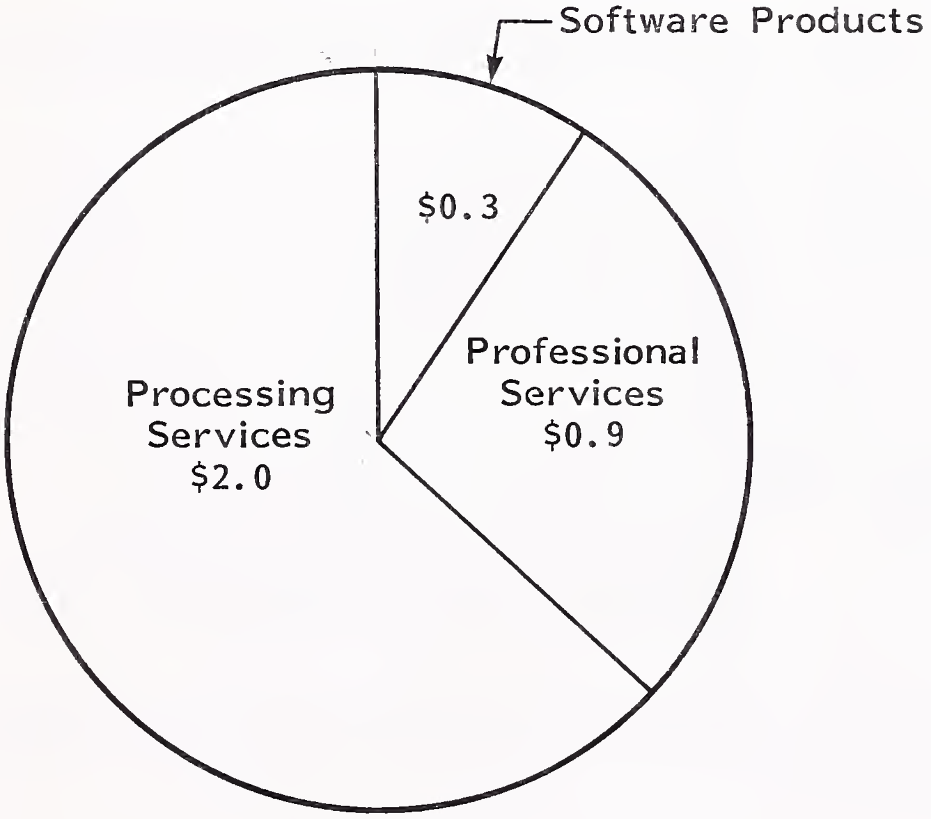
$14.8 billion

*Excludes DOD embedded software; includes DOD ADP software

EXHIBIT III-2

U.S. INFORMATION SERVICES MARKET, 1970*

(current $ billions)



$3.2 billion

*Excludes DOD embedded software; includes DOD ADP software

EXHIBIT III-3

1980 SOFTWARE PRODUCTS AND PROFESSIONAL SERVICES MARKET: DOD VERSUS ALL OTHER

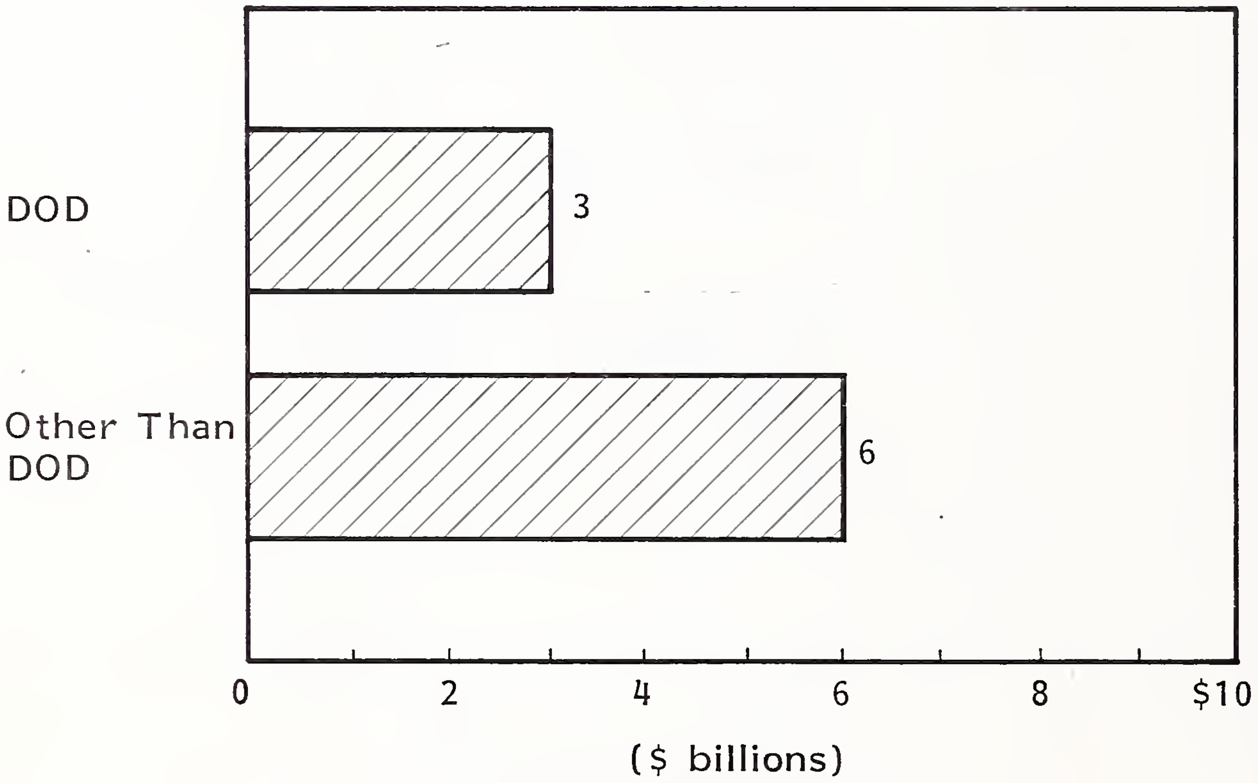
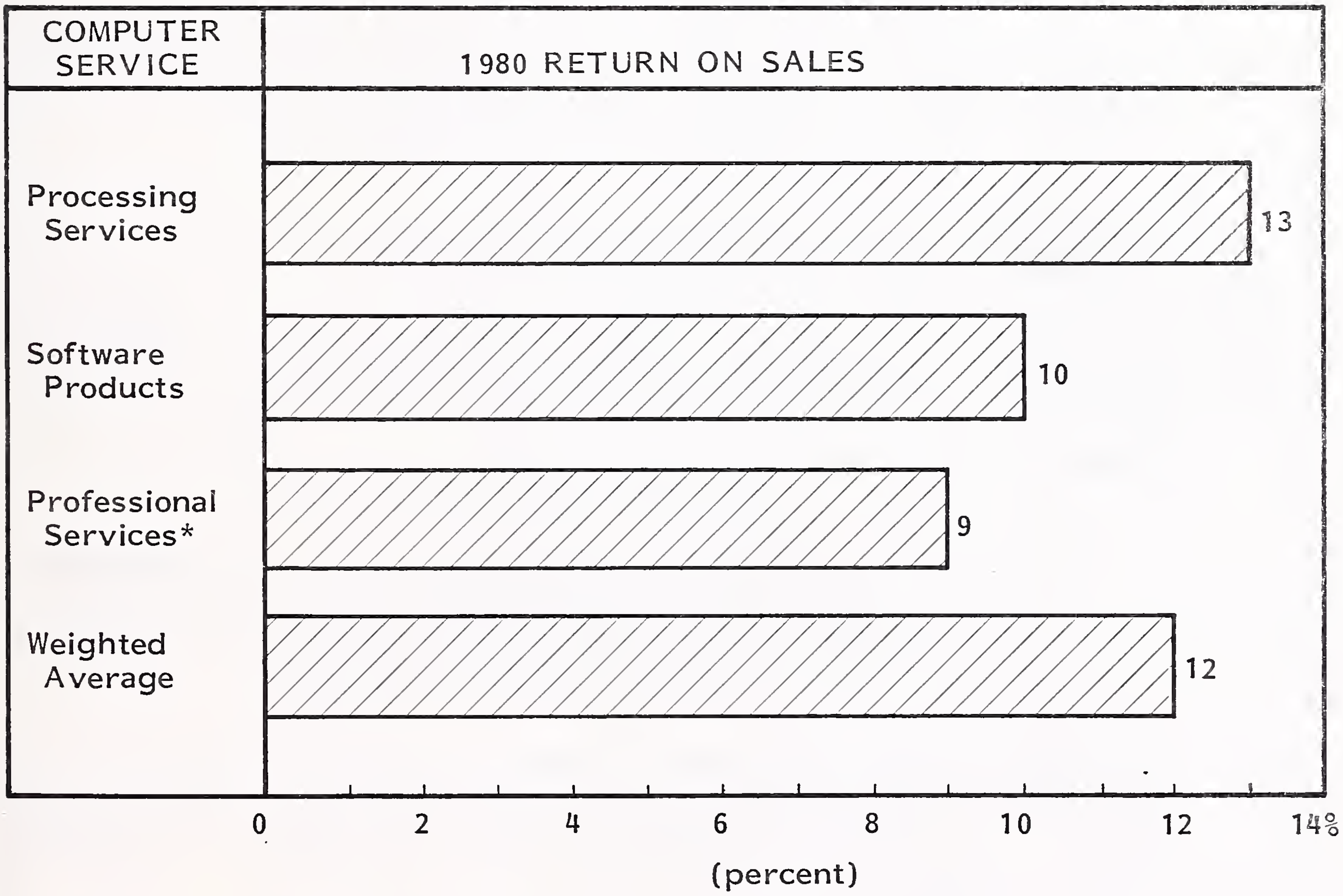


EXHIBIT III-4

1980 PUBLIC COMPANY PERFORMANCE



*Excludes embedded software/services.

  - Processing services profits were higher than average, since many of them are now mature "cash cows."

  - Professional service firms' profitability is lower, reflecting in large part ceilings existing in government and other contracts.

- Productivity, as measured in revenue per employee, is much higher for software products companies, reflecting the opportunities of successful firms to sell products at low marginal costs, as shown in Exhibit III-5.

- Two hardware companies, IBM and CDC, are the largest vendors of (non-embedded) computer services, as shown in Exhibit III-6.

C. COMMERCIAL SOFTWARE PRODUCTS FIRMS

- IBM is also the largest commercial software products vendor, as shown in Exhibit III-7, over seven times as large as CDC.

  - Note that all these vendors are also hardware vendors; this reflects the fact that system software represents over half the present software market and that the hardware firms still dominate it.

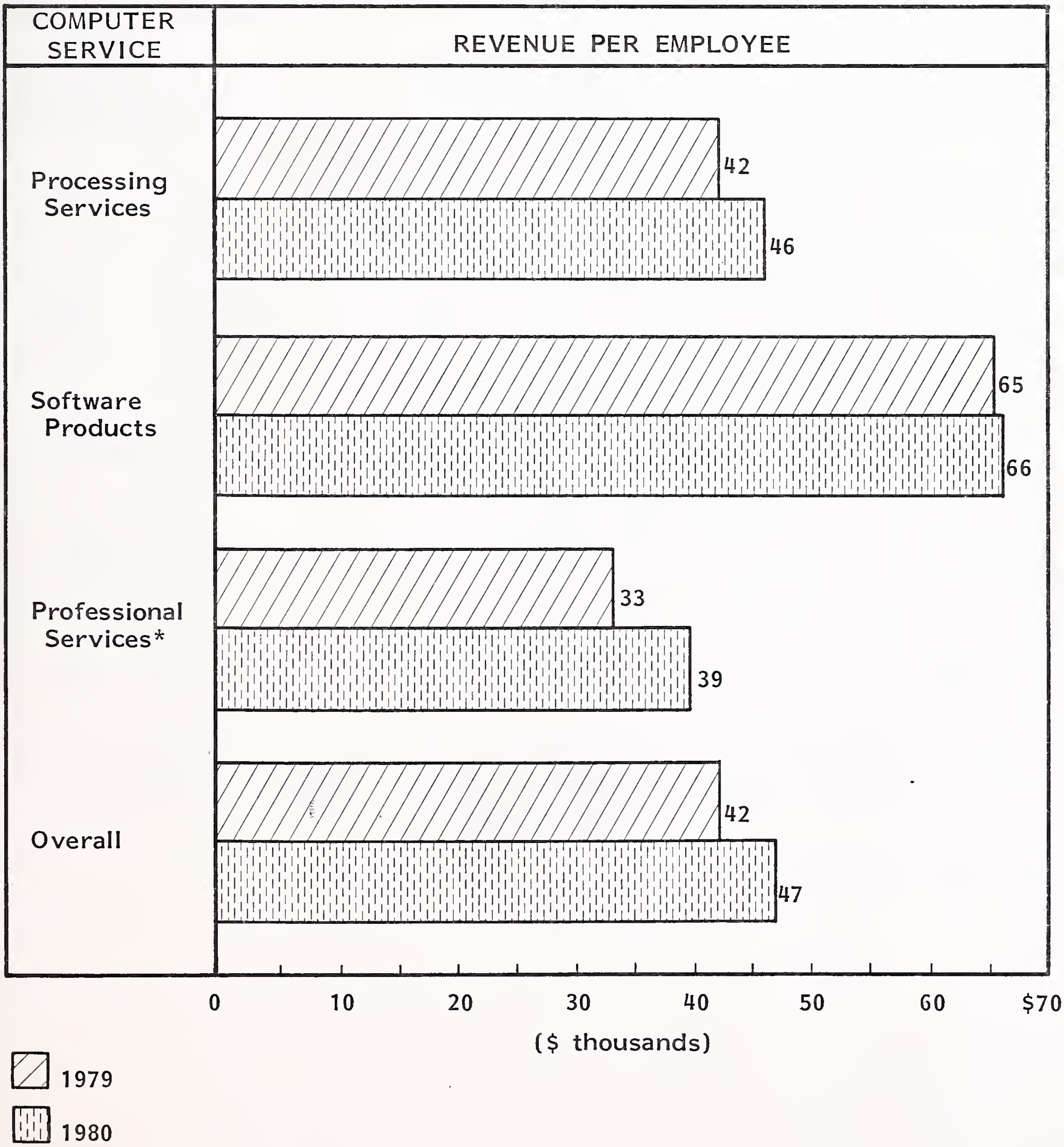
- The largest independent software suppliers generally show higher rates of growth than the hardware companies' software operations, as shown in Exhibit III-8.

  - Other smaller software vendors show very high rates of growth, as shown in Exhibit III-9.

    - The Anacomp and Westinghouse rates also reflect effects of acquisitions.

EXHIBIT III-5

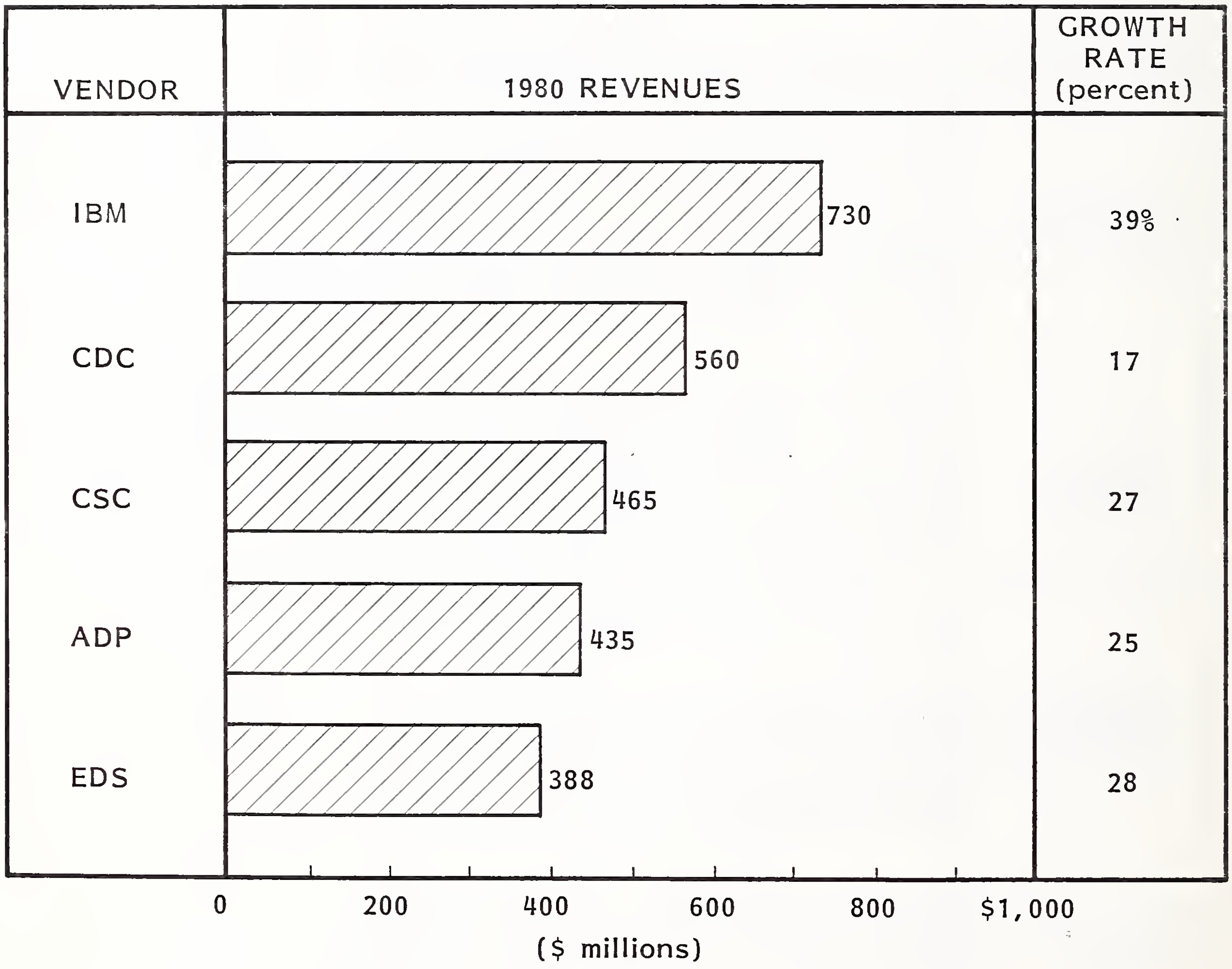
PRODUCTIVITY IN 1979 AND 1980



*Excludes embedded software/services.

EXHIBIT III-6

LARGEST INFORMATION SERVICES VENDORS*



*Excludes embedded software/services.

EXHIBIT III-7

LARGEST SOFTWARE PRODUCTS VENDORS

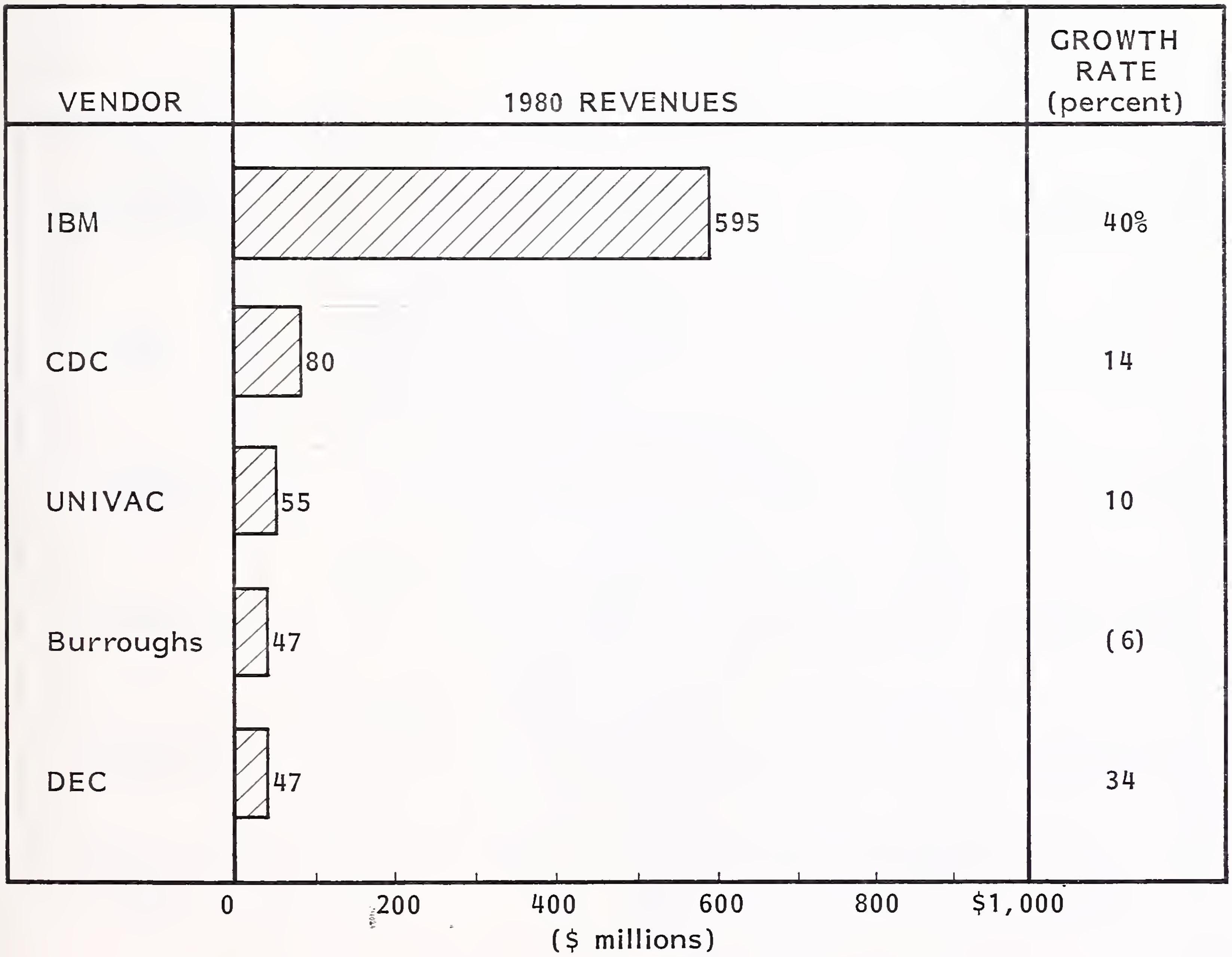


EXHIBIT III-8

LARGEST INDEPENDENT SOFTWARE PRODUCTS VENDORS

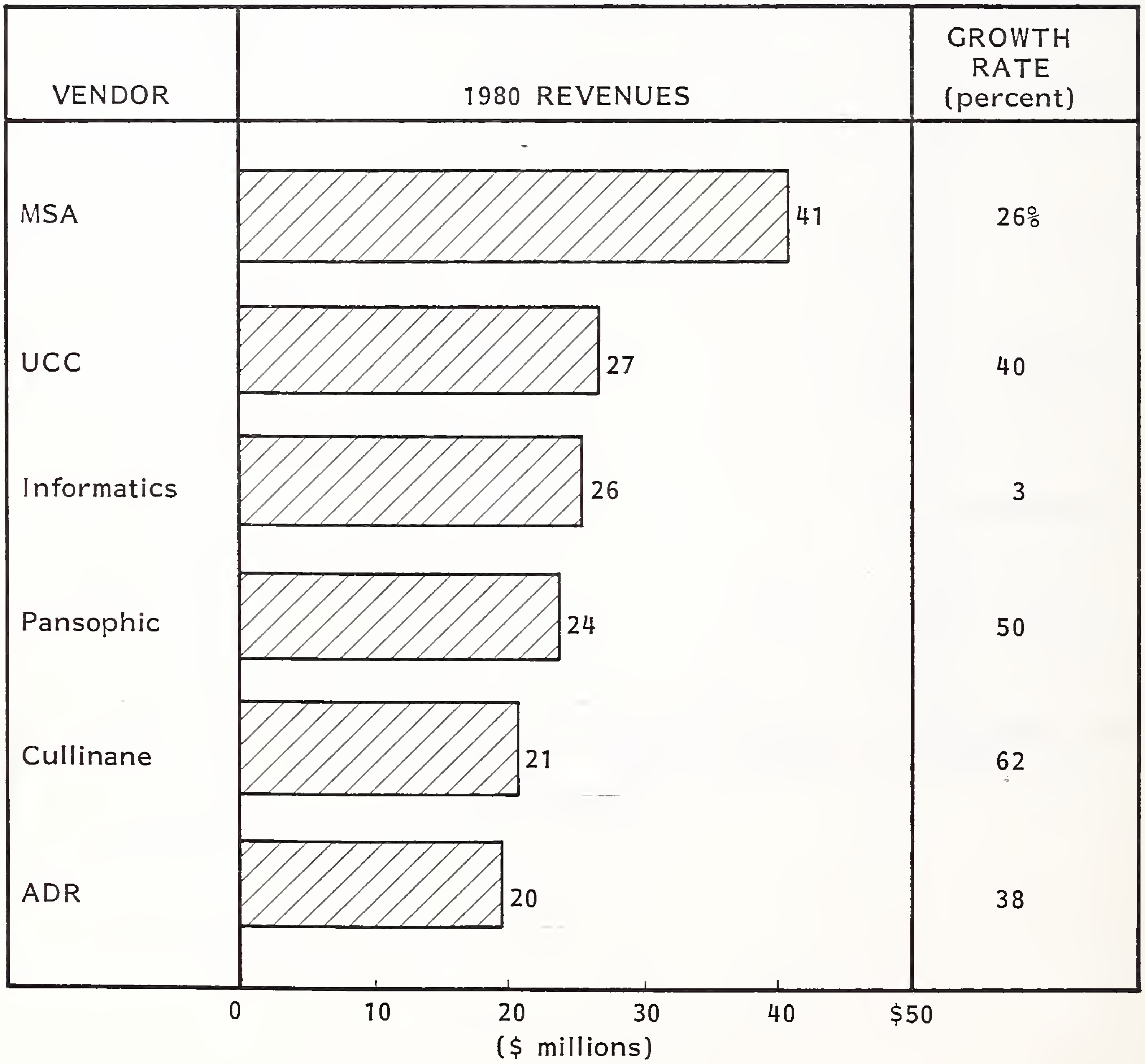
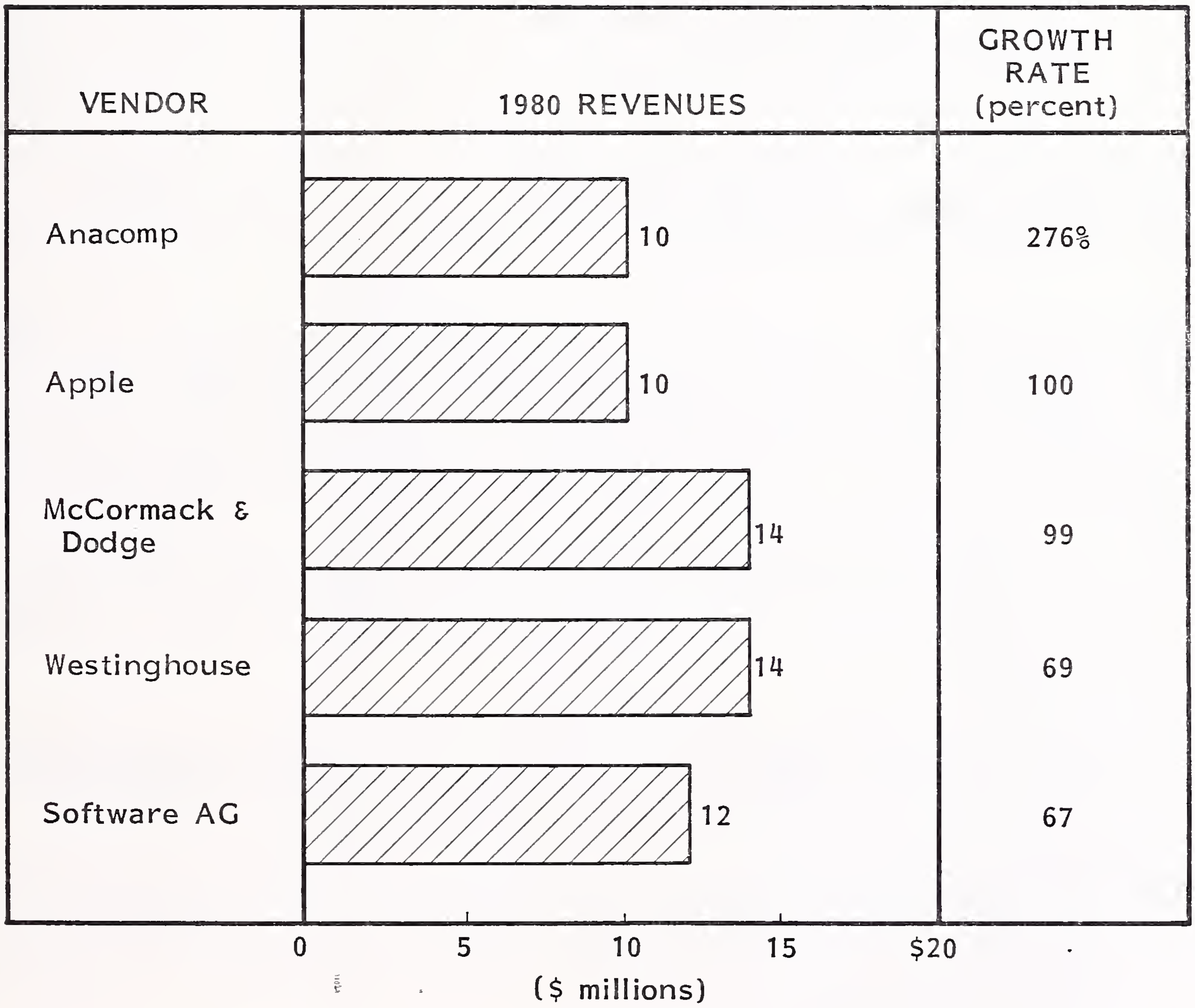


EXHIBIT III-9

FASTEST GROWING VENDORS - SOFTWARE PRODUCTS OVER $10 MILLION



- The applications software market is much more fragmented, with the computer manufacturers between them accounting for less than one quarter of the market, as shown in Exhibit III-10.

- The DOD market for off-the-shelf software is, relatively speaking, not large, probably under $50 million annually.

D. PROFESSIONAL SERVICES

- Professional services (excluding DOD embedded systems) are more evenly balanced than software products, with the leading firm, CSC, only twice as large as the second largest firm, as shown in Exhibit III-11.

  - Leading professional services company growth is very respectable, but not as high as for software products companies, as shown in Exhibit III-12.

- The leading processing service firms are even more balanced in size, reflecting the maturity and competitiveness of this sector, as shown in Exhibit III-13.

- Most DOD "software and services" purchases would be classified as professional services. There are two major categories: Automatic Data Processing (ADP) and Embedded Systems.

  - ADP consists of:

    - Commercial off-the-shelf purchases.

    - "Information technology," analogous to business uses.

    - General purpose hardware or software.

EXHIBIT III-10

1980 APPLICATIONS SOFTWARE PRODUCTS MARKET

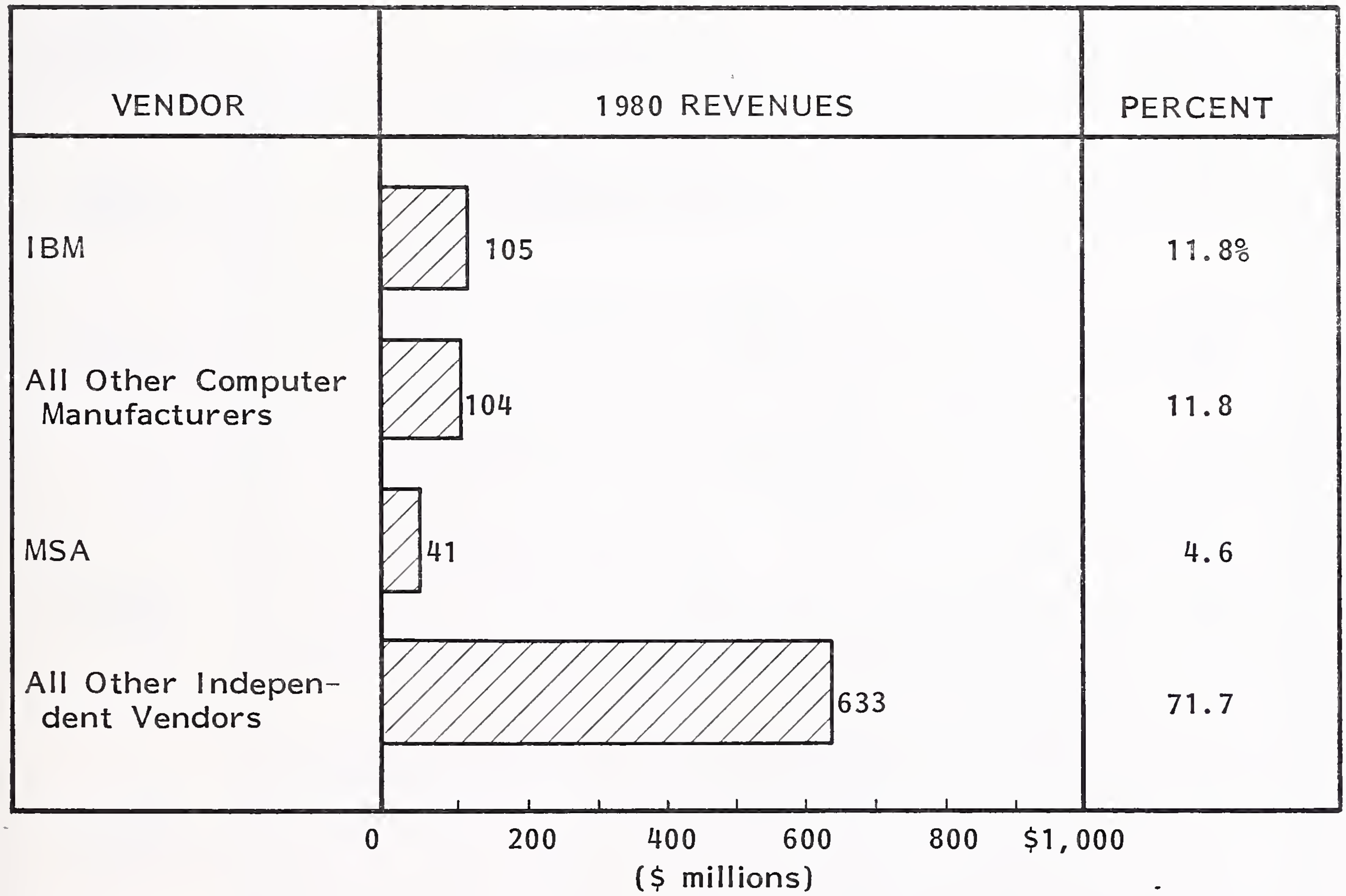
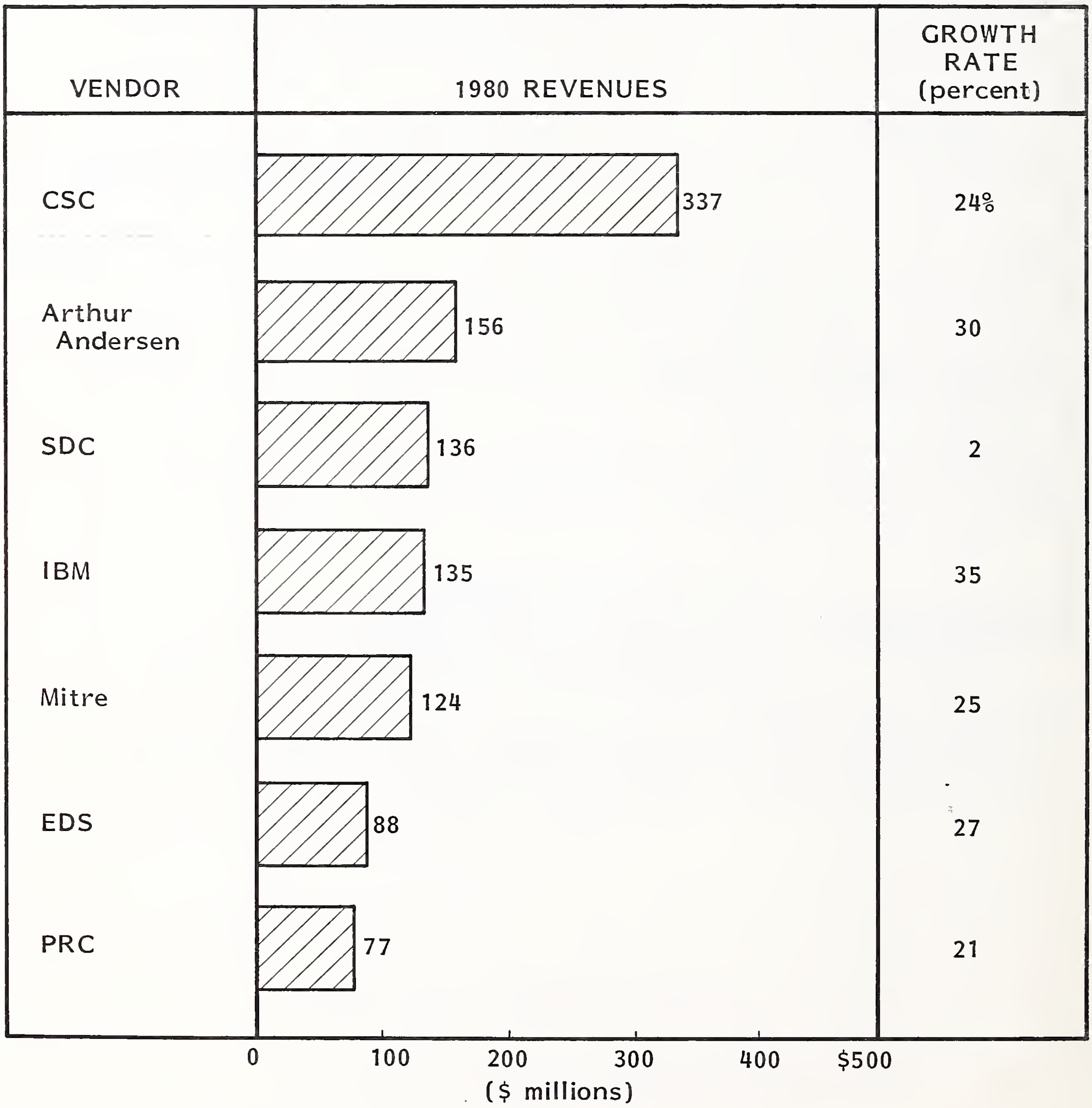


EXHIBIT III-11

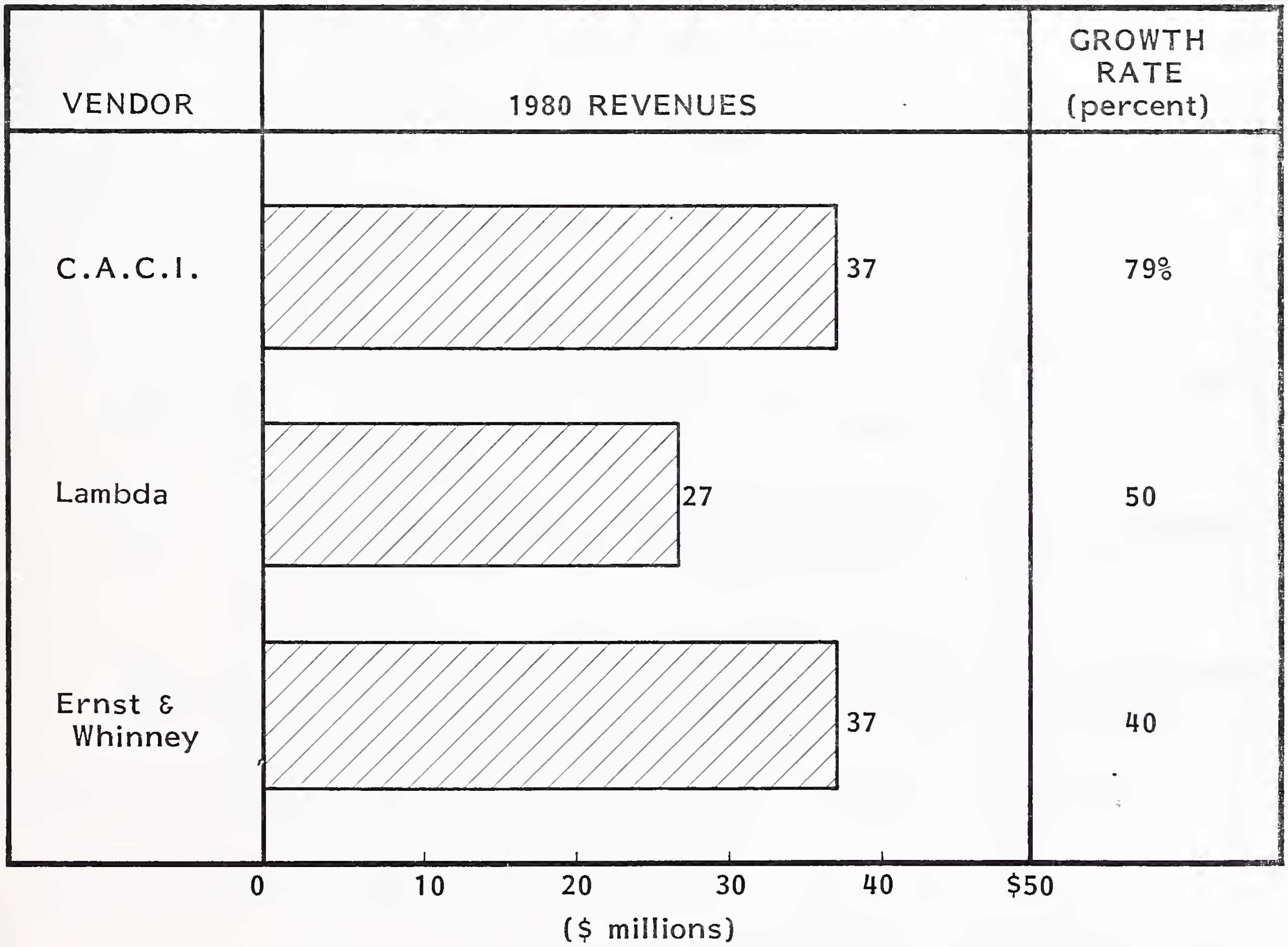
LARGEST PROFESSIONAL SERVICES VENDORS*



* Excludes embedded software/services.

EXHIBIT III-12

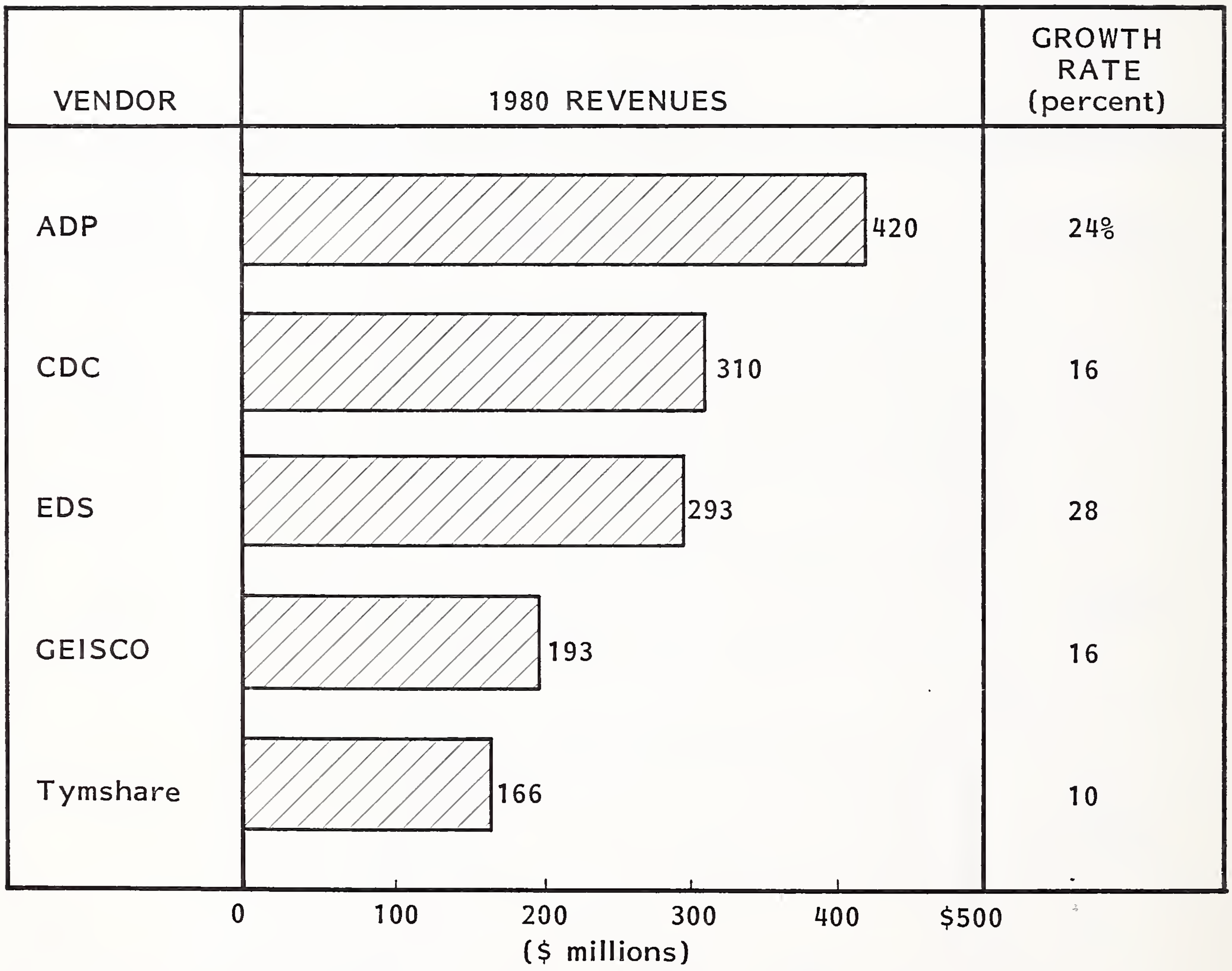
FASTEST GROWING VENDORS - PROFESSIONAL SERVICES OVER $25 MILLION*



*Excludes embedded software/services.

EXHIBIT III-13

LARGEST PROCESSING SERVICES VENDORS*



*Excludes embedded software/services.

        - Acquisition by GSA under Brooks law (PL 89-309).

    - Embedded systems are far more specialized.

        - Specially designed (e.g., Mil-Spec).

        - Acquired as part of weapons package.

- Both sectors represent major expenditure areas within DOD. In 1980, software and service expenditures were:

    - $2.8 billion for embedded systems.

    - $1.8 billion for ADP.

- However, what is most important for FACC is that almost 90% of the embedded total represents outside purchases, while under 30% of the ADP total is for outside purchases, as shown in Exhibit III-14.

    - The actual market is thus five times as great in the embedded software area.

- Already, software and service expenditures are twice as great as hardware expenditures, as shown in Exhibit III-15. This trend is expected to continue.

E. ACQUISITION ACTIVITY

- In the first eight months of 1981 there were approximately 50 acquisitions. This compares to 87 in 1980 and 107 in 1979.

    - The average size of the 1981 acquisition was considerably larger than in prior years.

EXHIBIT III-14

1980 DOD SOFTWARE AND SERVICE EXPENDITURES: IN-HOUSE VERSUS PURCHASES

($ billions)

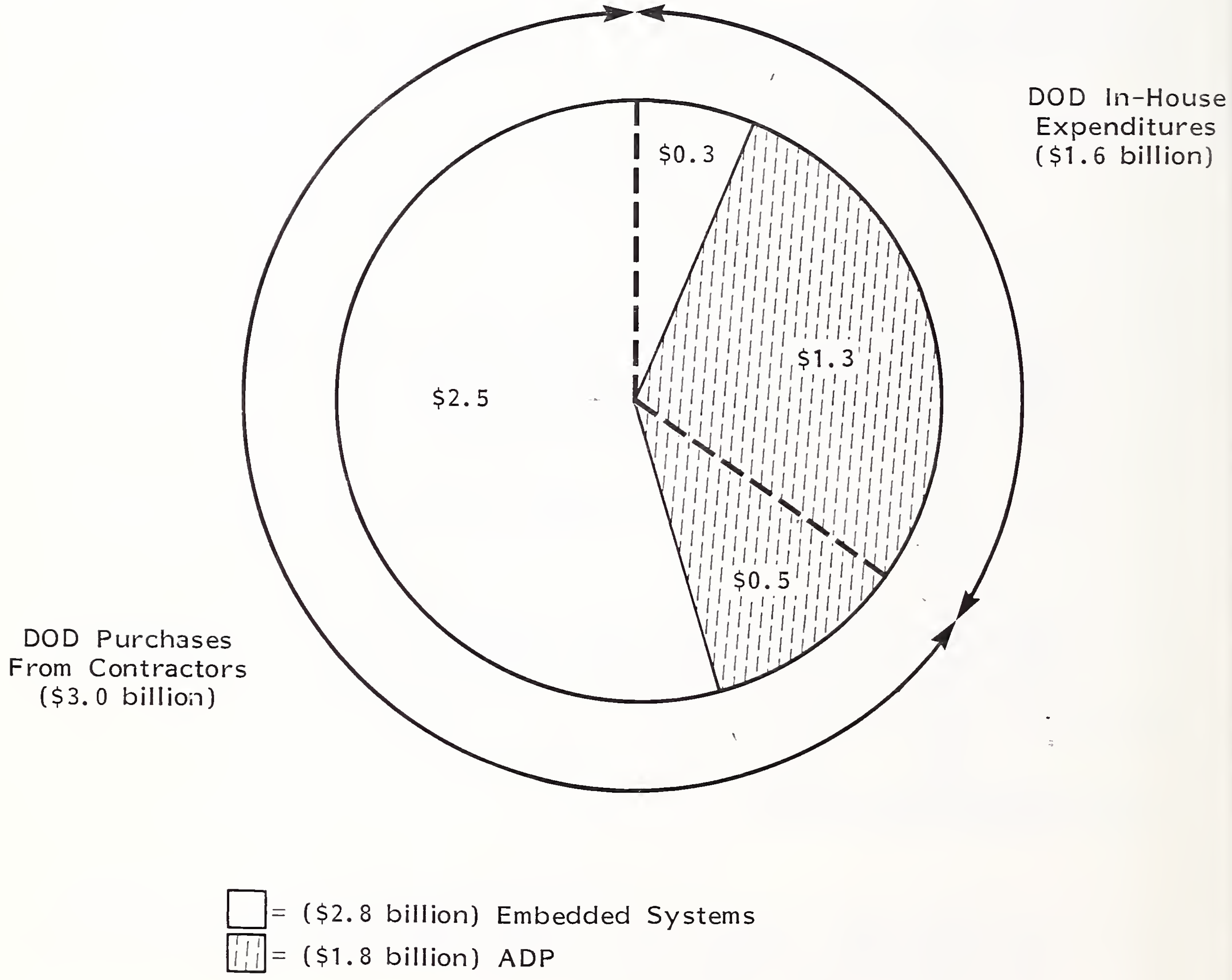


EXHIBIT III-15

1980 DOD COMPUTER HARDWARE AND SOFTWARE EXPENDITURES

($ billions)

AREA	SOFTWARE AND SERVICES	COMPUTER HARDWARE	TOTAL
Embedded	$2.8	$1.3	$4.1
ADP	1.8	0.9	2.6
TOTALS	$4.6	$2.1	$6.7

NOTE: Some lines do not total because of rounding

  - Exhibit III-16 shows major acquisitions thus far in 1981.

  - Firms within the industry are quite active in acquisitions, as shown in Exhibit III-17.

  - However, non-computer firms are increasingly active also, as shown in Exhibit III-18.

- A key consideration in any acquisition is how well the "fit" will be between the acquiring company and the company being acquired. Factors affecting the goodness of the fit include:

  - Size disparity.

  - Shared management style.

  - Autonomy, actual versus expected.

  - Shared markets.

  - Shared products.

- Fit becomes critical in acquiring software and professional service companies where the capital investment "walks home every night."

EXHIBIT III-16

MAJOR ACQUISITIONS: 1981

ACQUIRED	ACQUIROR	VALUE (millions)
MDSI	Schlumberger	$187
Calma	GEISCO	100
SDC	Burroughs	98
ISA	United Telecom	41
Lambda	GEISCO	22
Source Telecomputing	Readers Digest	12
DASD	CAP GEMINI	11
Data Corporation of America	ADP	5

EXHIBIT III-17

ACQUISITION ACTIVITY BY COMPUTER SERVICE FIRMS

ACQUIRED	ACQUIROR
Transportation Computing Automated Systems Design Professional Software Systems	Informatics
Centurion	EDS
Microband ITT Travel Services	Tymshare
MCCI	Sun
PRAXA	Xerox
Executive Systems, Inc. Florida Computer Systems	AMS
DSI	Anacomp
Rapidata	National Data
Software International Banking Systems, Inc. Energy Enterprises, Inc.	GEISCO
ISD	CDC
Peachtree Software	MSA
Worldwide Software Association	Oxford Software Corp.

EXHIBIT III-18

ACQUISITION ACTIVITY BY NON-COMPUTER SERVICE FIRMS

ACQUIRED	ACQUIROR
Predicasts	Indian Head
Computer Applications Corporation	Pioneer Hybrid
Comprehensive Computing	COMSAT
Worldwide Computer Services	General Devices, Inc.
Bunker Ramo	Allied (Chemical) Corporation

IV KEY ISSUES

IV KEY ISSUES

A. OVERVIEW

- Several key developments are now underway which will have significant impacts on the software market.
  - The two most important technical changes are:
    - The rising flood of microprocessors.
    - Emerging optical storage systems.
  - Other technical developments include:
    - Data base machines.
    - Mainframe price reductions.
- Key environmental issues involve:
  - The rise of office systems and associated dispersal of data processing in the commercial systems sector, both use and purchasing.

    - Increased military electronics budgets, expected to increase by almost 400% between 1980 and 1990.

    - The growth of competition in the computer services industry.

- These issues will be discussed in more detail below.

B. MICROPROCESSORS

- Microprocessors have had profound effects on both military and nonmilitary applications.

    - As a member of the Electronic Industry Association computer study group noted, for military electronics, "clearly, the terms 'digital computers' and 'electronics' are becoming synonymous."

    - DOD bought 10,110 embedded computers in 1980 and will buy about 250,000 units in 1990.

    - The software component of DOD computer spending already amounts to about 65% of current spending.

- The effects on the commercial sector will be at least as striking.

    - Over 600,000 personal computer systems are expected to be in place in Fortune 500/50 companies by 1986.

        - This would be one computer for every ten employees.

        - Leading edge firms would be even more advanced.

    - The effects on word processing and terminals will also be impressive.

- Personal computer software will have different characteristics, compared to traditional software; i.e.:
  - Nontraditional pricing.
  - Portable.
  - Disposable.
  - Two thousand listed sources, many being nontraditional.
  - Few of the many software sources will prove viable.
- Examples of nontraditional distribution channels are shown in Exhibit IV-1.
- IBM has taken a similarly nontraditional approach, as shown in Exhibit IV-2.

- Personal computer software will probably be produced and marketed very much like books are today.
  - Producers, often individuals, will bring their software to distributors who will evaluate and edit it and stand behind the product.

C. OPTICAL STORAGE

- Videodisk storage promises a revolutionary discontinuity in storage price performance, as shown in Exhibit IV-3.
- A few videodisk storage products have been marketed, but videodisk is only beginning to enter the life cycle development curve, as shown in Exhibit IV-4.

EXHIBIT IV-1

PERSONAL COMPUTER SOFTWARE DISTRIBUTION CHANNELS

- User Groups/Clubs
- Manufacturers
- Stores
- System Vendors
- Employees
- Software Companies
- Software Brokers/Publishers
- Supplies Companies
- Non-Computer Companies

EXHIBIT IV-2

IBM PERSONAL COMPUTER SOFTWARE

COMPONENTS	NONTRADITIONAL APPROACH
MICROSOFT: BASIC 80 and ADVENTURE Digital Research: CP/M Personal Software: VISICALC Information Unlimited Software: EASY WRITER Peachtree Software: Accounting Programs Provided "As Is"	Product "Manufacturing" through Outside Components Distribution Channels - Employees - Sears - Computerland - IBM Maintenance Applications Development by Royalty-Sharing Employees

EXHIBIT IV-3

PROJECTED VIDEODISK STORAGE COSTS

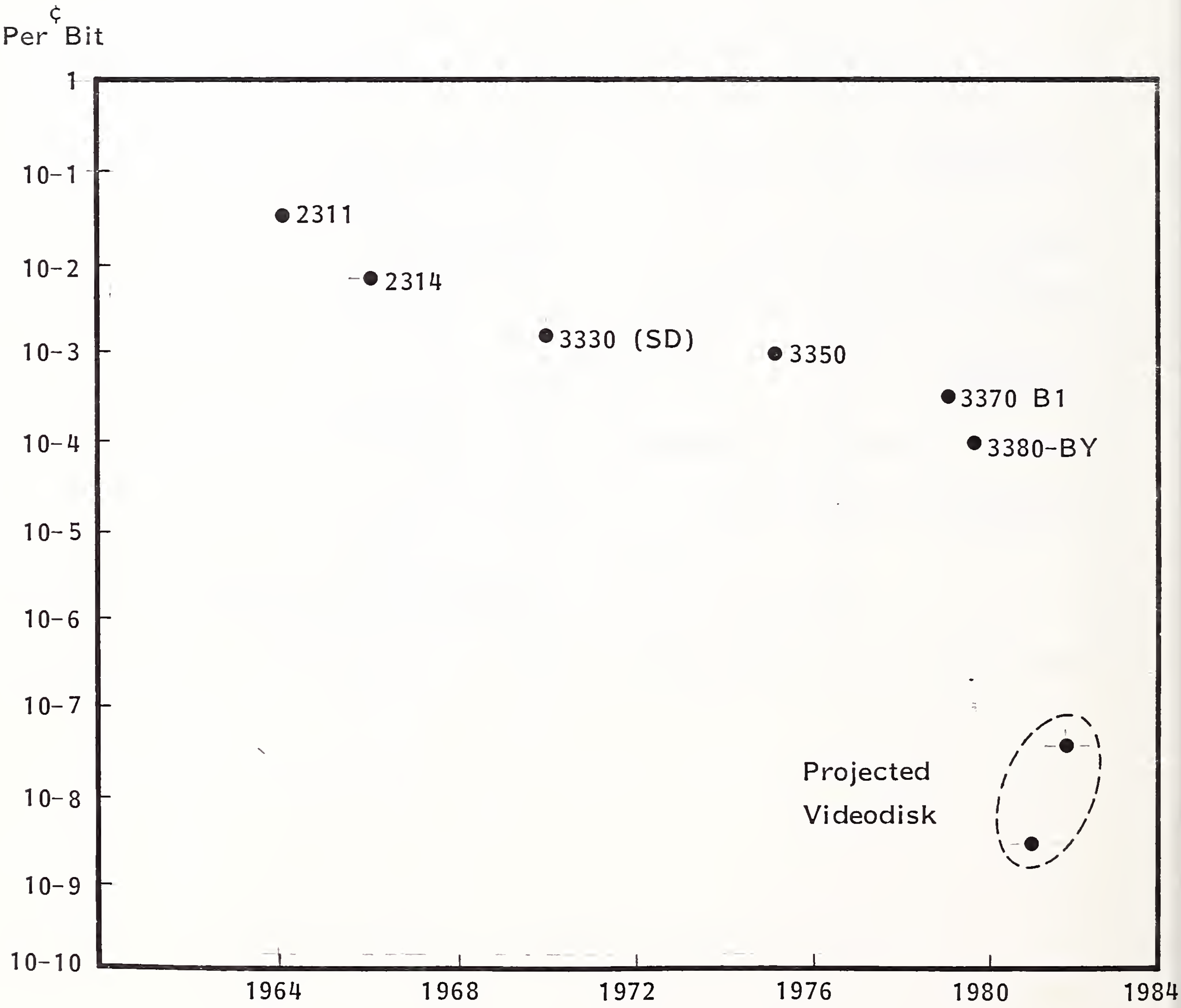
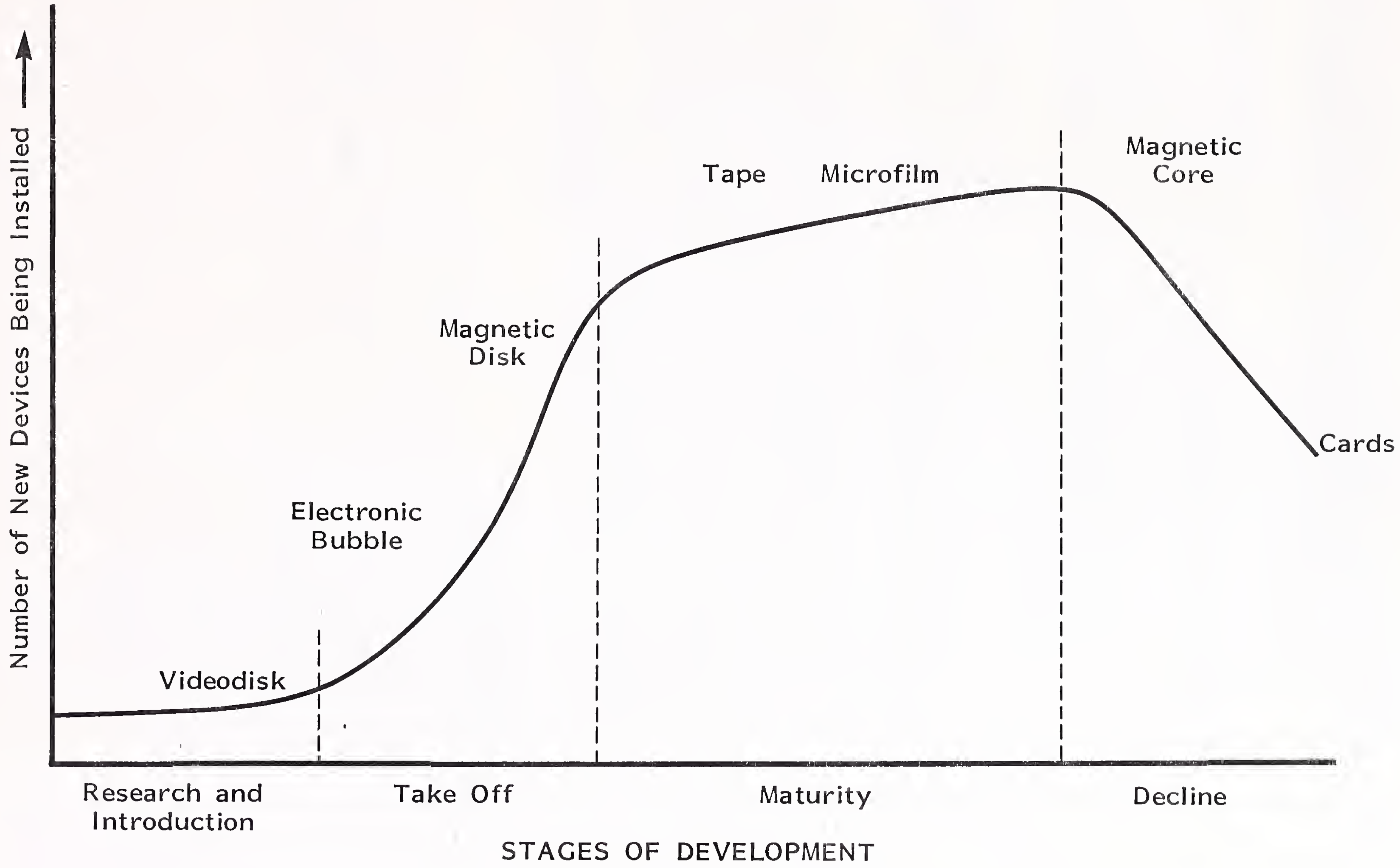


EXHIBIT IV-4

RELATIVE DEVELOPMENT LIFE CYCLE CHARACTERISTICS OF STORAGE MEDIA



  - Although there are still error-rate problems, there are none of the price-performance problems that have held back electronic bubble, for example.

- The main impacts that should be expected are:

  - The on-line data base market will be revolutionized, with, for example, relatively static graphics-oriented data moving out to dispersed microprocessors.

  - The enormous amounts of cheap storage will provide the last piece in the office systems puzzle.

  - In larger computer systems, much existing software (both systems software and applications software) will become obsolete.

- The military has been one of the early users of optical storage systems for training purposes (e.g., tank maintenance). Their considerable success and satisfaction to date promise wider use in the future.

D. OFFICE SYSTEMS

- The office systems market represents the single most attractive commercial market today since it unites a strong need to increase productivity with the technology to do it; i.e.:

  - Microprocessors.

  - Videodisk storage.

  - Local networks.

- The software needs for office systems will be high, since no adequate software for most applications now exists. The impacts will be on:

  - Systems software for:

    - Local networks management.

    - Office systems/host systems integration.

  - Applications software for:

    - The constantly improving capabilities of small computers.

    - True word processor/personal computer integration.

- The military impact will probably not be as striking, compared to other areas, but should still be significant.

E. NEW BUYING PATTERNS

- In many businesses, new buying patterns for computer services are already apparent as more computing responsibilities are taken over by end users, as shown in Exhibit IV-5.

  - This is fueled by the high costs and shortages of EDP personnel.

  - Large increases in outside software purchases are the most common way to fill the gap and are the motivating force behind much of the increase in software product sales, as shown in Exhibit IV-6.

EXHIBIT IV-5

COMPONENTS OF THE TOTAL INFORMATION PROCESSING BUDGET

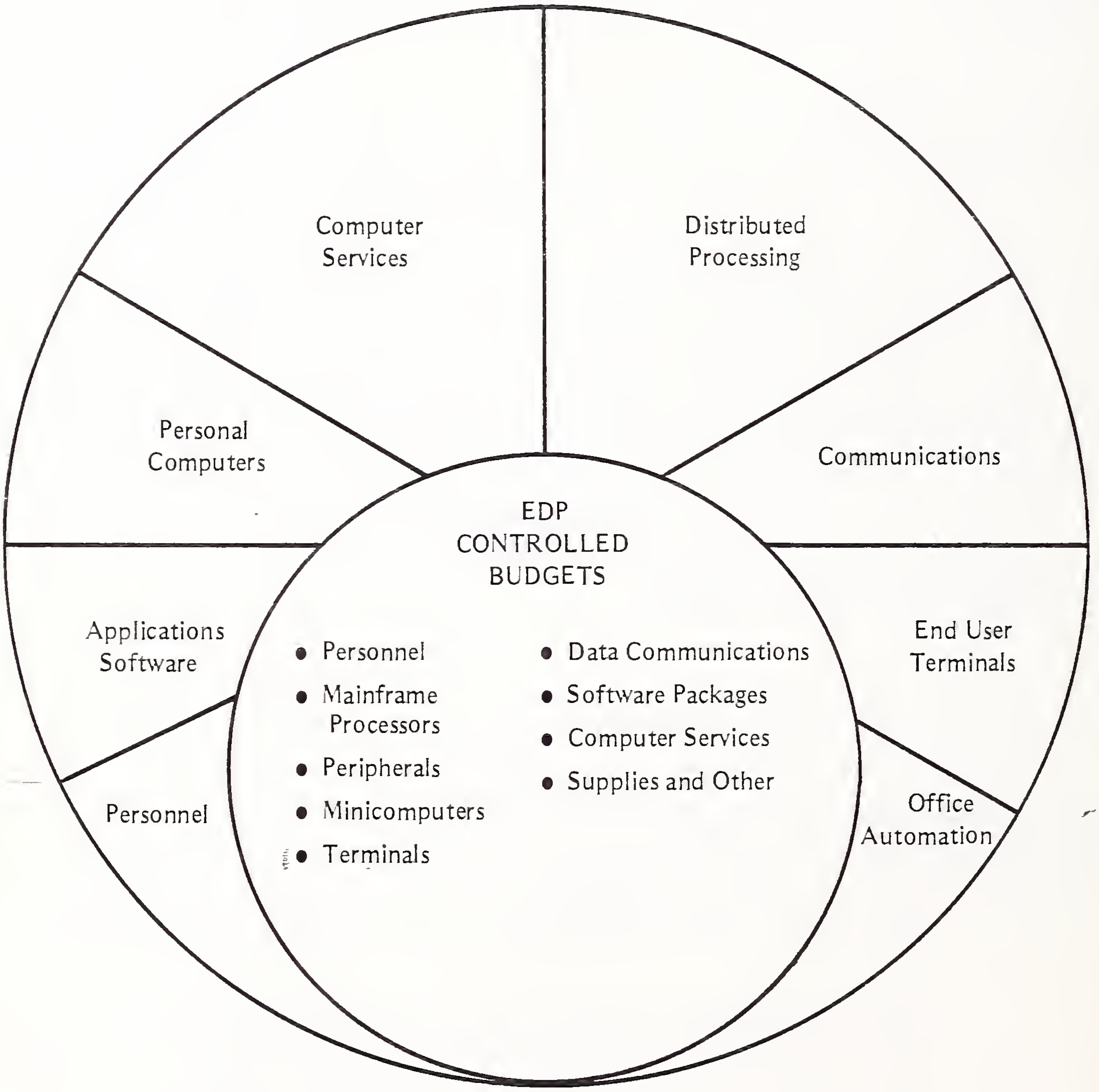
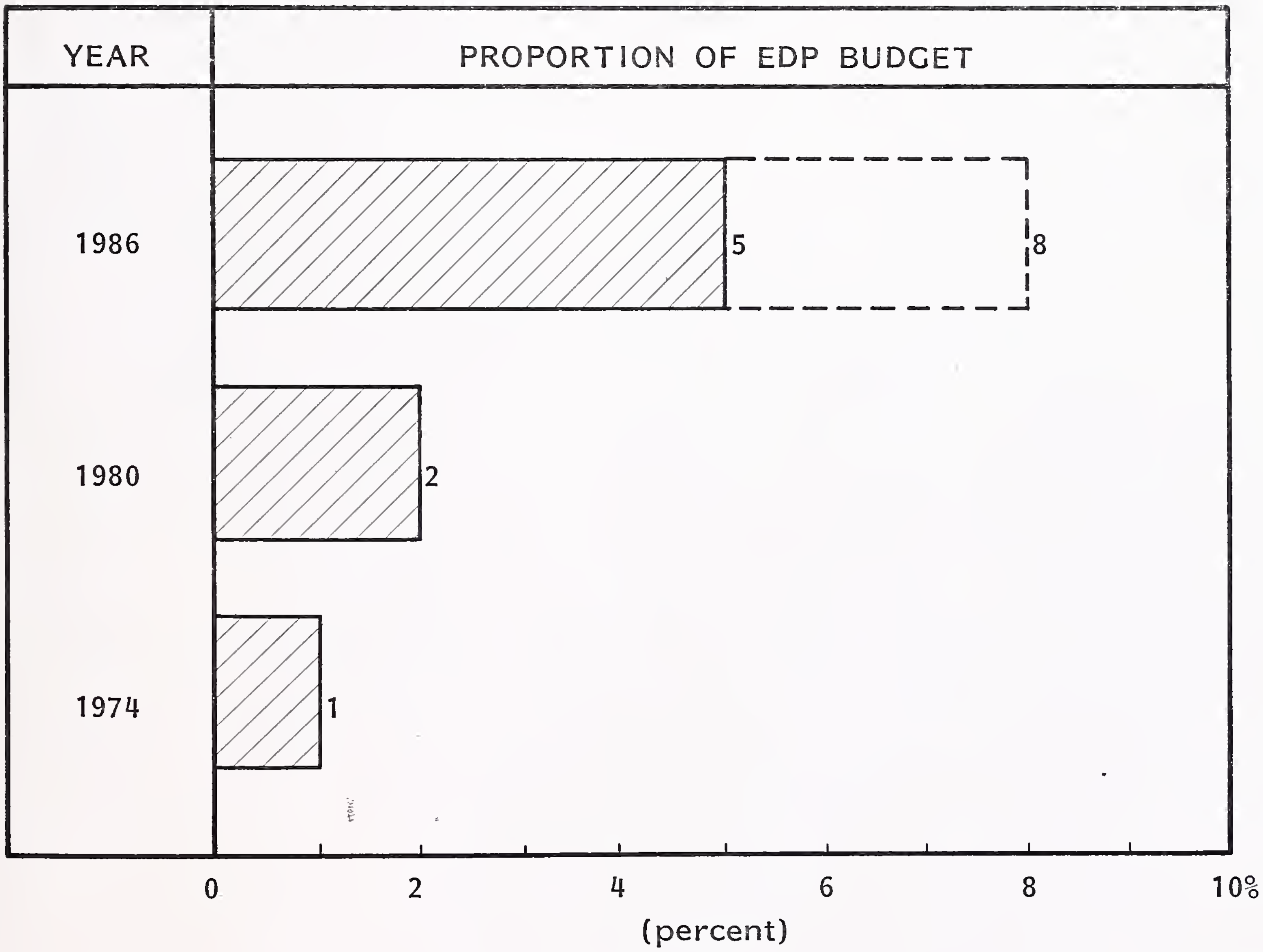


EXHIBIT IV-6

SOFTWARE PRODUCTS



- As the military use of microprocessors increases, and smaller items use microprocessors, a similar dispersal in buying and recommending points should be expected.

- In both areas, the microprocessor should make possible systems that appear far more customized and flexible to the users but are actually more standardized from the vendor's standpoint.

  - In the military area this assumes that a few large politically powerful procurements (e.g., the B-1) do not squeeze out the others.

V FORECASTS

V FORECASTS

- Software will be under great pressure to become more standardized and off-the-shelf. Even optimistic forecasts of language performance improvements are nowhere near past and projected improvements in hardware, as shown in Exhibit V-1.

- Both DOD embedded and other software and services are expected to grow almost 400% by 1986, as shown in Exhibit V-2.

- The computer services market outside of the DOD embedded systems market is expected to grow over 250% (including a 9.8% inflation rate), as shown in Exhibit V-3 and V-4, with software products showing the fastest growth, as shown in Exhibit V-5.

  - While overall, systems software should show the faster rate of increase, as shown in Exhibit V-6, certain application areas such as very small computer applications software, as shown in Exhibit V-7, and wholesale, retail and process manufacturing are expected to show very high rates of increase, as shown in Exhibit V-8.

- Another important potential market for a company like FACC is the scientific/technical area.

  - The overall CAD/CAM market promises to grow by almost 50% annually between 1980 and 1986, as shown in Exhibit V-9. A consider-

EXHIBIT V-1

HARDWARE VERSUS SOFTWARE IMPROVEMENTS, COST/PERFORMANCE

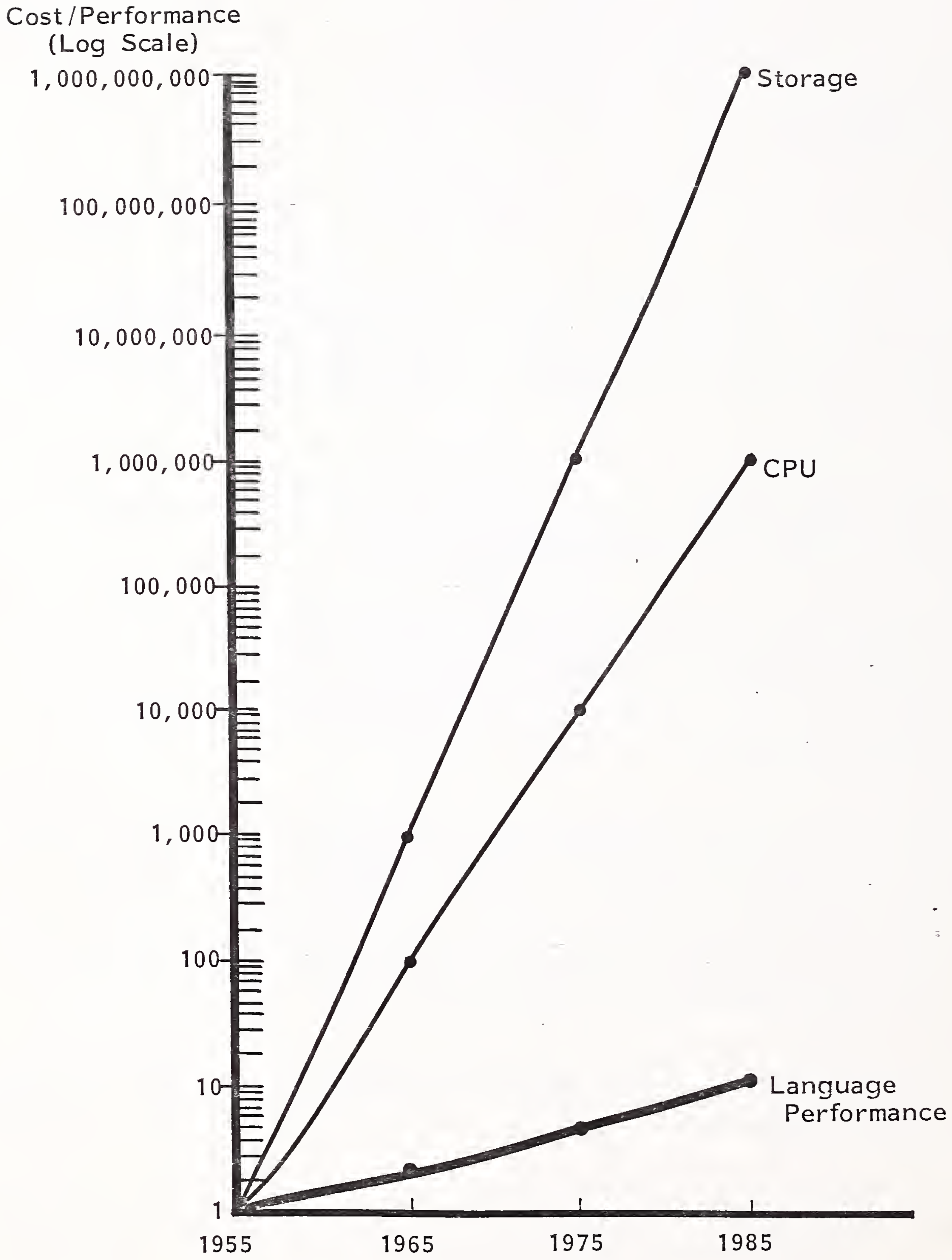


EXHIBIT V-2

1986 SOFTWARE PRODUCTS AND PROFESSIONAL SERVICES MARKETS - DOD EMBEDDED VERSUS ALL OTHER

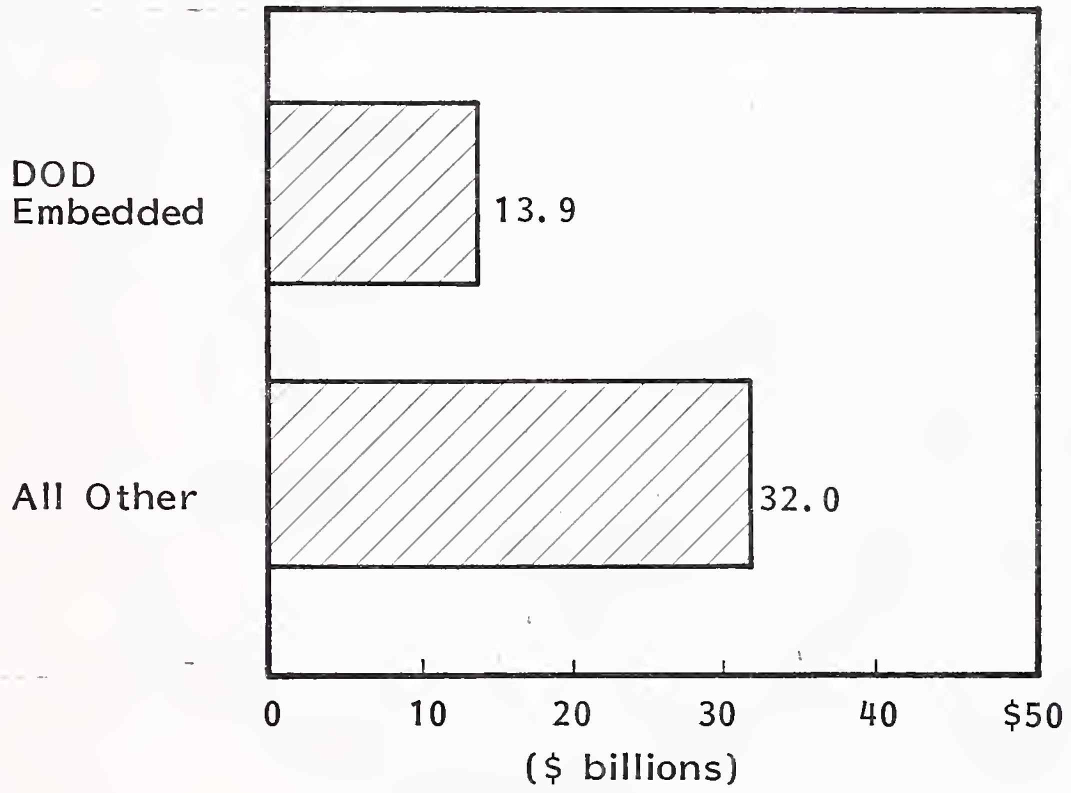
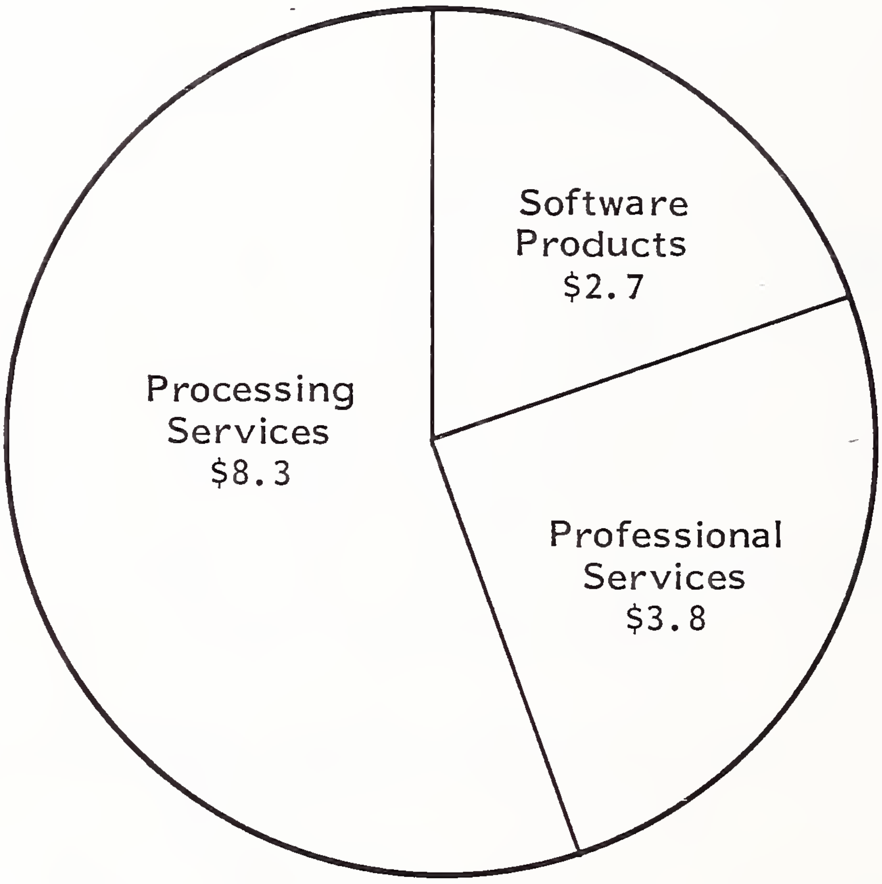


EXHIBIT V-3

U.S. COMPUTER SERVICES MARKET, 1980*

(current $ billions)



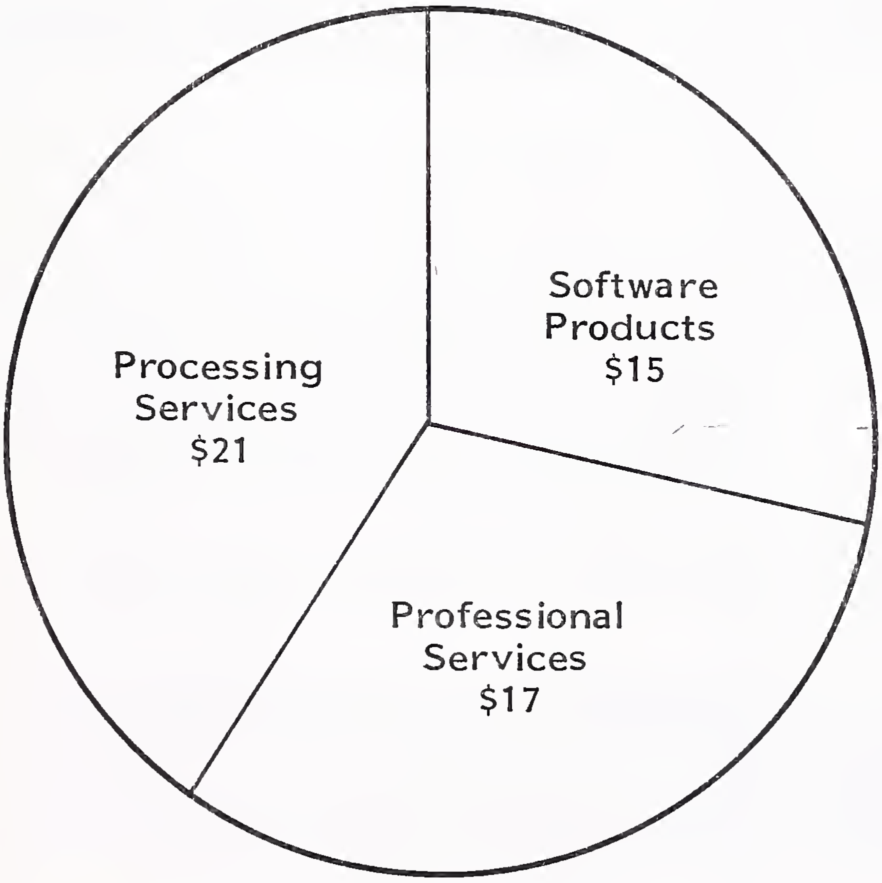
$14.8 billion

*Excludes DOD embedded systems; includes DOD ADP

EXHIBIT V-4

U.S. COMPUTER SERVICES MARKET, 1986*

(current $ billions)

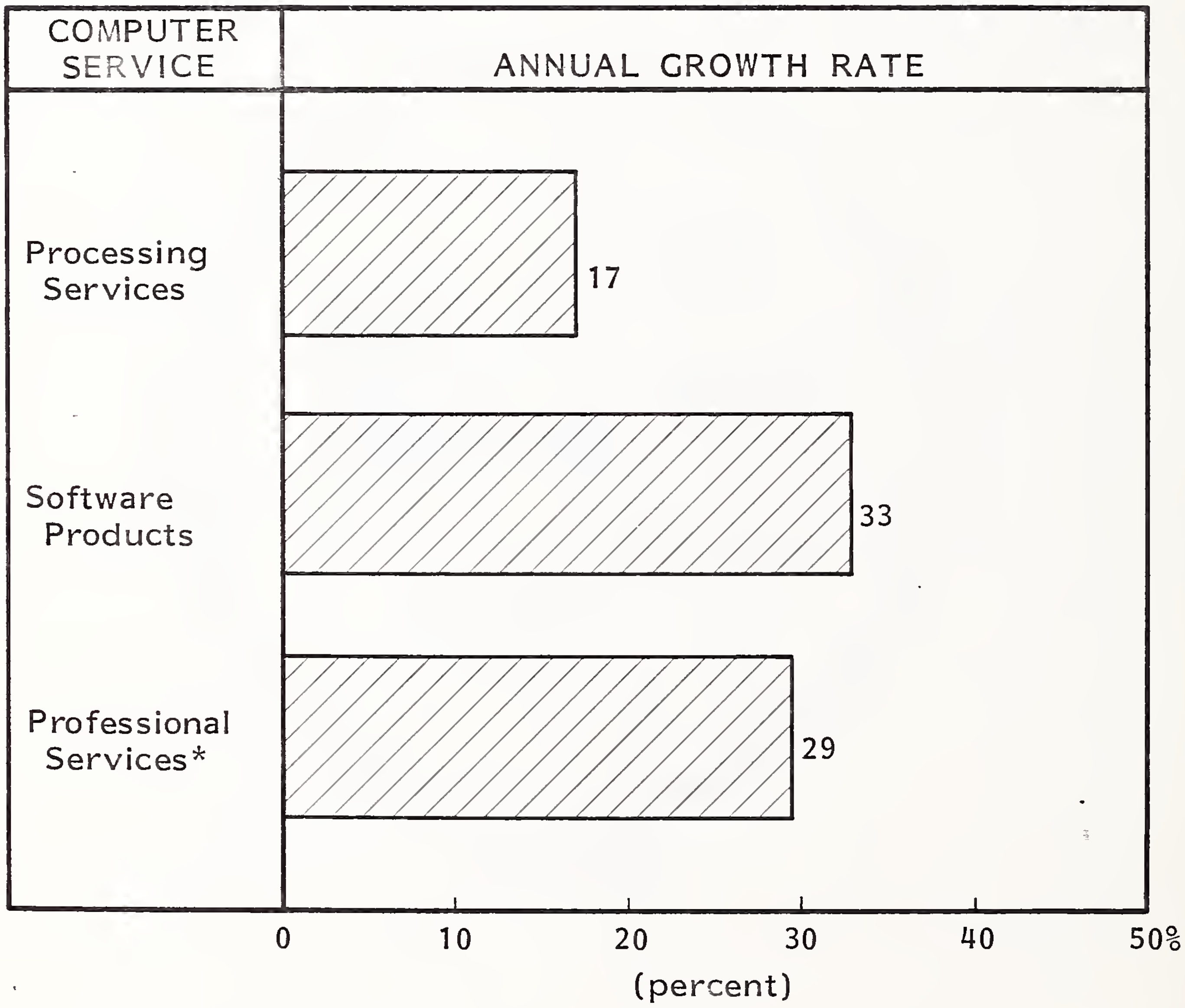


$53 billion

*Excludes DOD embedded systems; includes DOD ADP

EXHIBIT V-5

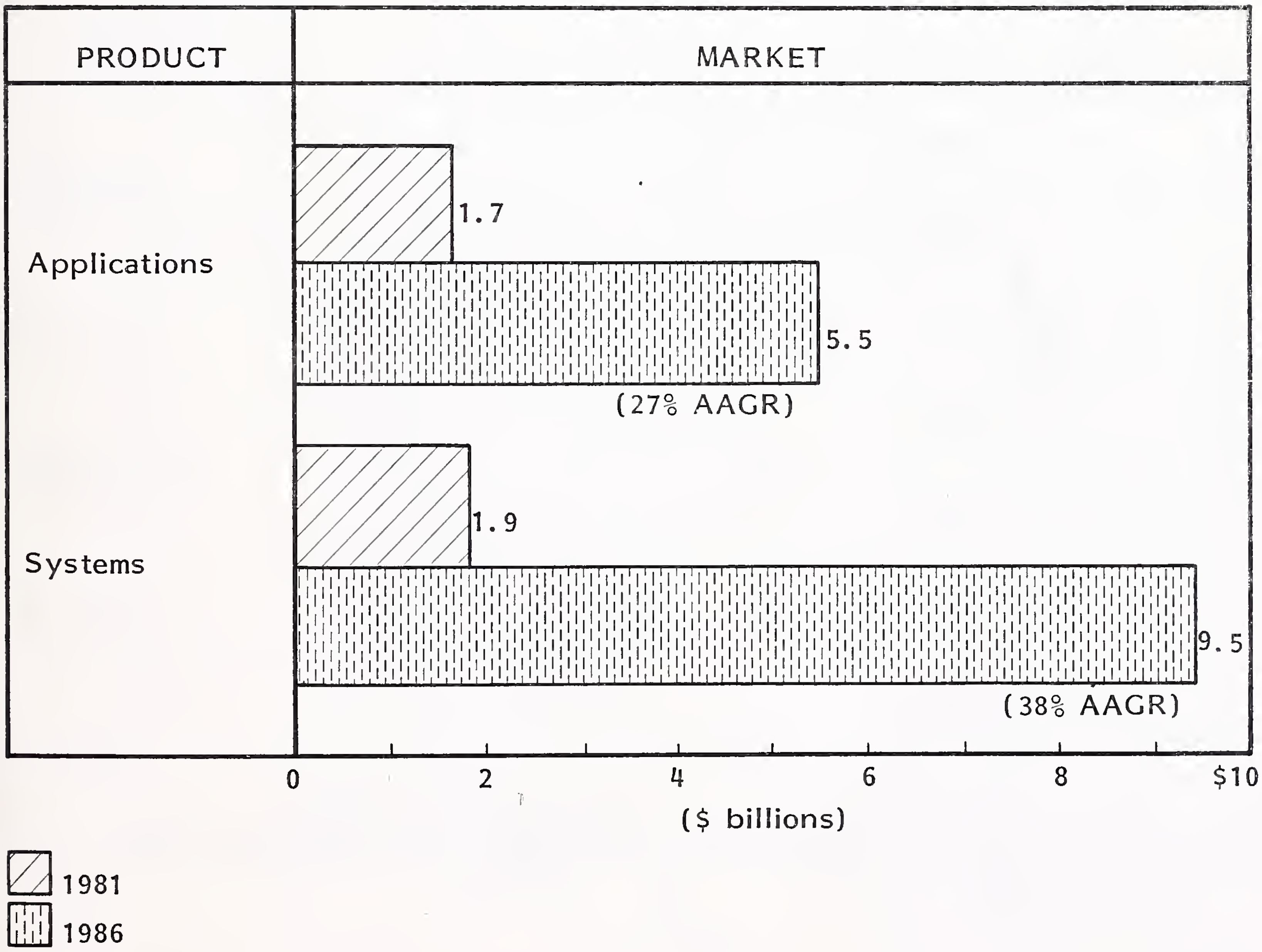
COMPUTER SERVICES MARKET ANNUAL GROWTH RATE, 1981-1986



* Excludes DOD embedded systems; includes DOD ADP

EXHIBIT V-6

SOFTWARE PRODUCTS*



*Excludes DOD embedded systems; includes DOD ADP

EXHIBIT V-7

VERY SMALL COMPUTER APPLICATIONS PRODUCTS MARKET

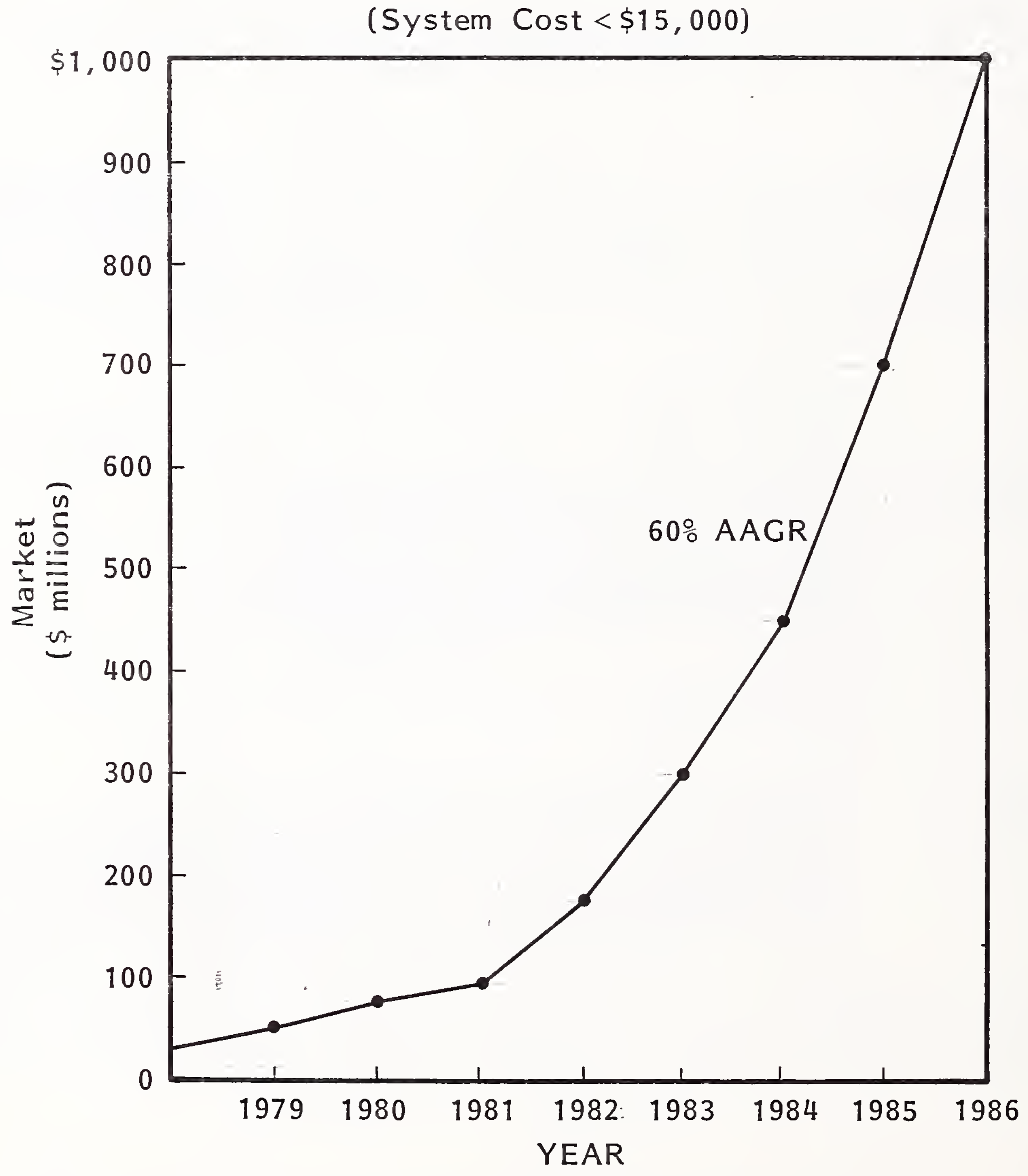


EXHIBIT V-8

APPLICATIONS SOFTWARE PRODUCTS MARKETS - GROWTH IN SELECTED INDUSTRY SECTORS

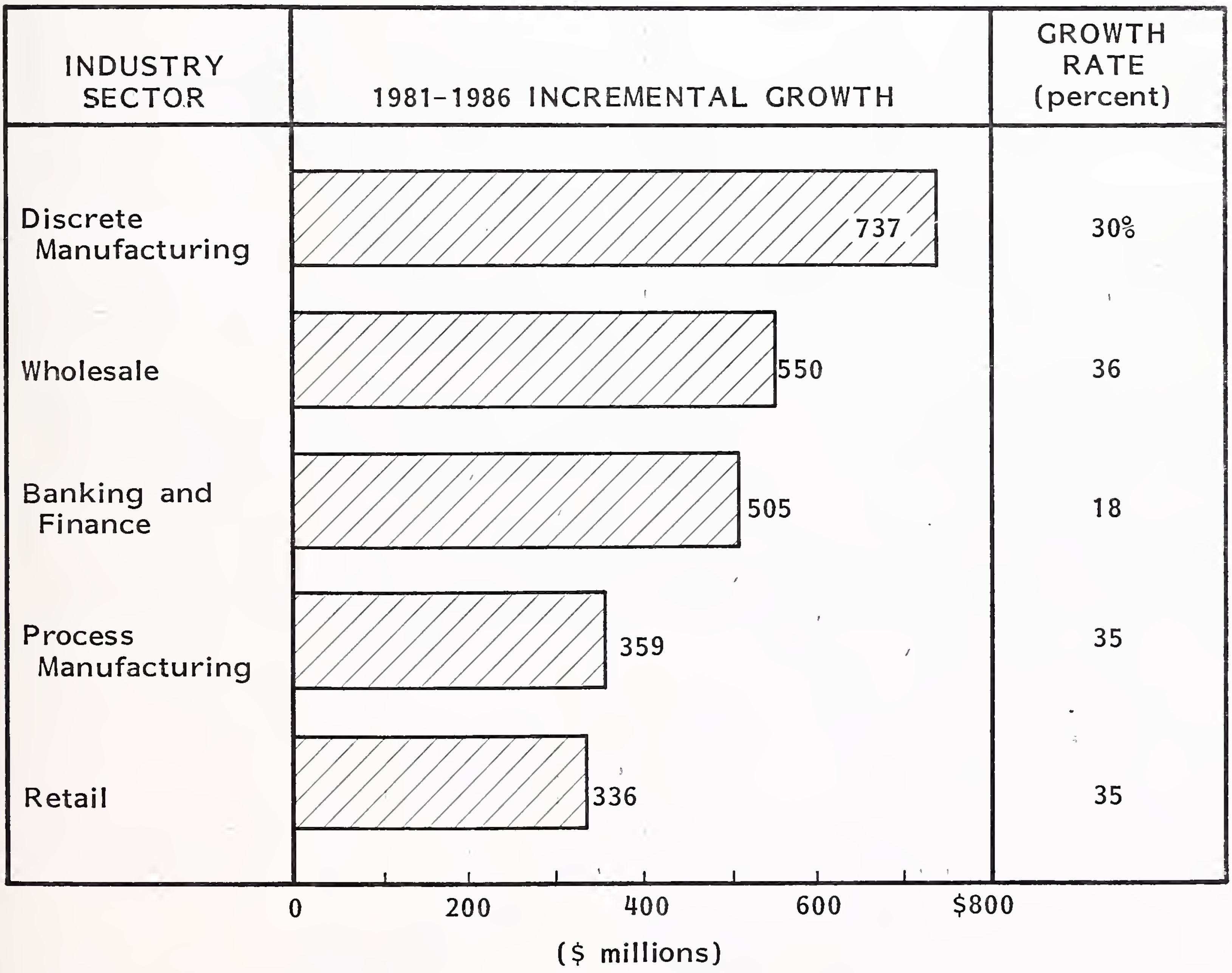
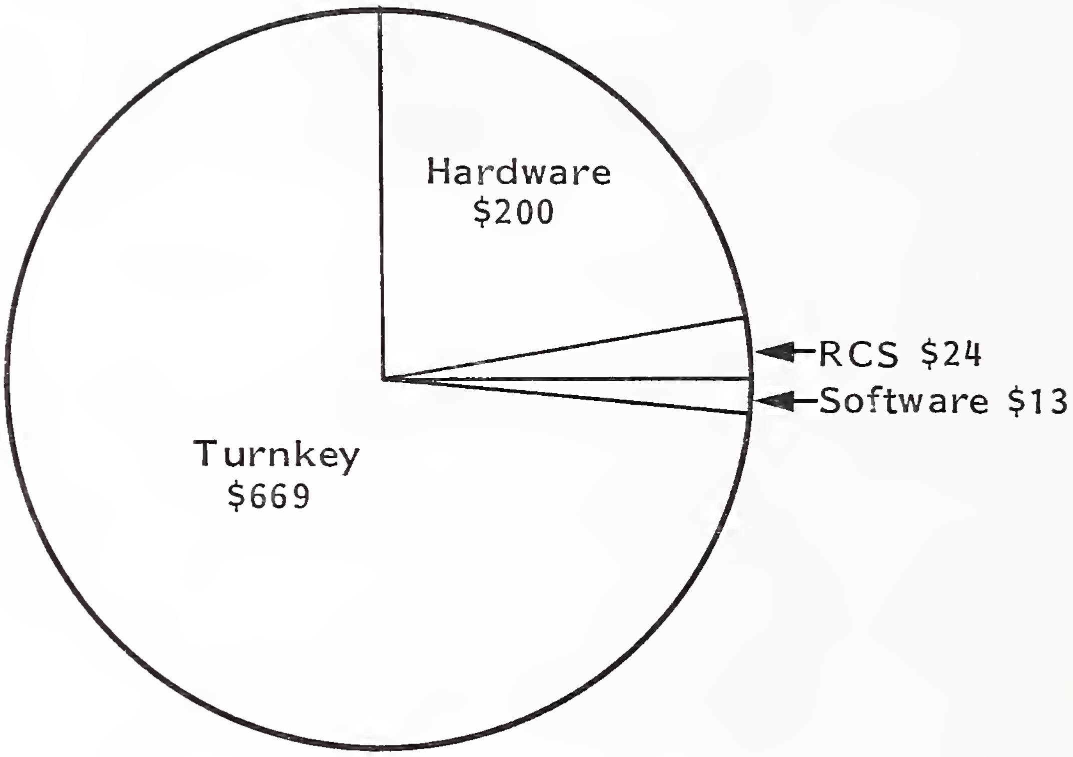


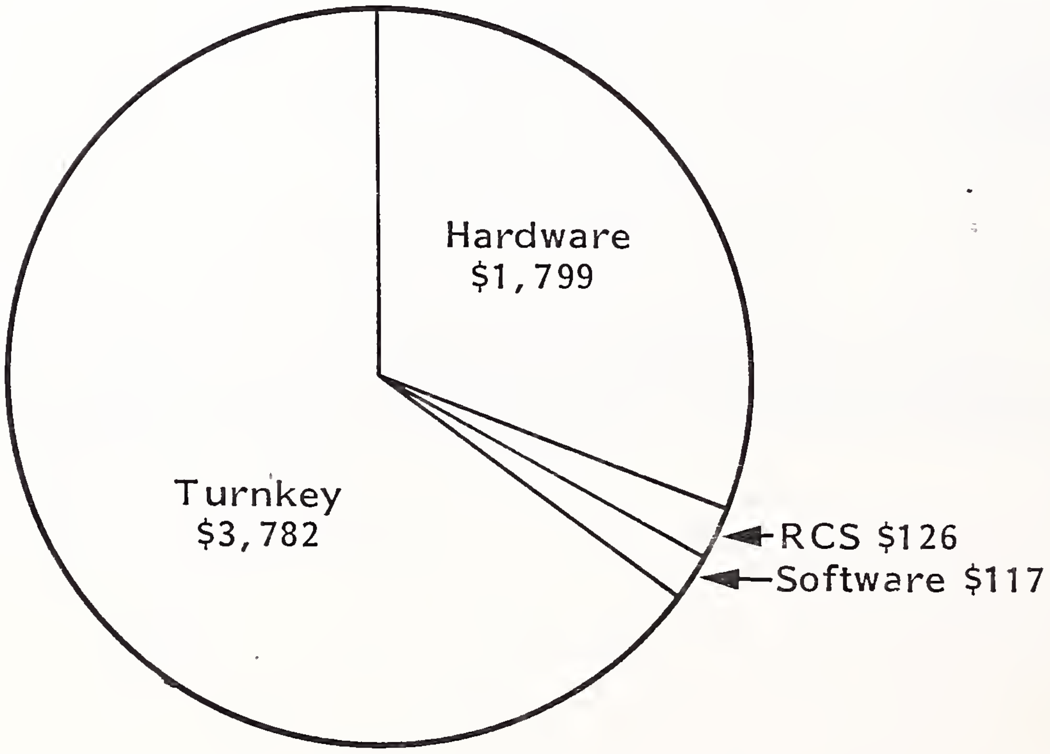
EXHIBIT V-9

FORECAST OF CAD/CAM MARKET, 1980-1986

($ millions)



1980
$906 million



1986
$5,824 million

able amount of this is pure hardware or the hardware component of a turnkey system.

  - The energy market, especially petroleum exploration, is another market with similar high growth rates projected, as shown in Exhibits V-10 and V-11.

- Within the DOD area it is striking to compare the 1986 position of embedded software against ADP software and services expenditures, as shown in Exhibit V-12.

  - While in 1980 ADP total expenditures were about two-thirds of embedded, by 1986 they will be less than one quarter as large.

  - When keeping in mind the proportions of the respective expenditures spent on outside contractors, the differences become even more striking, as shown in Exhibit V-13.

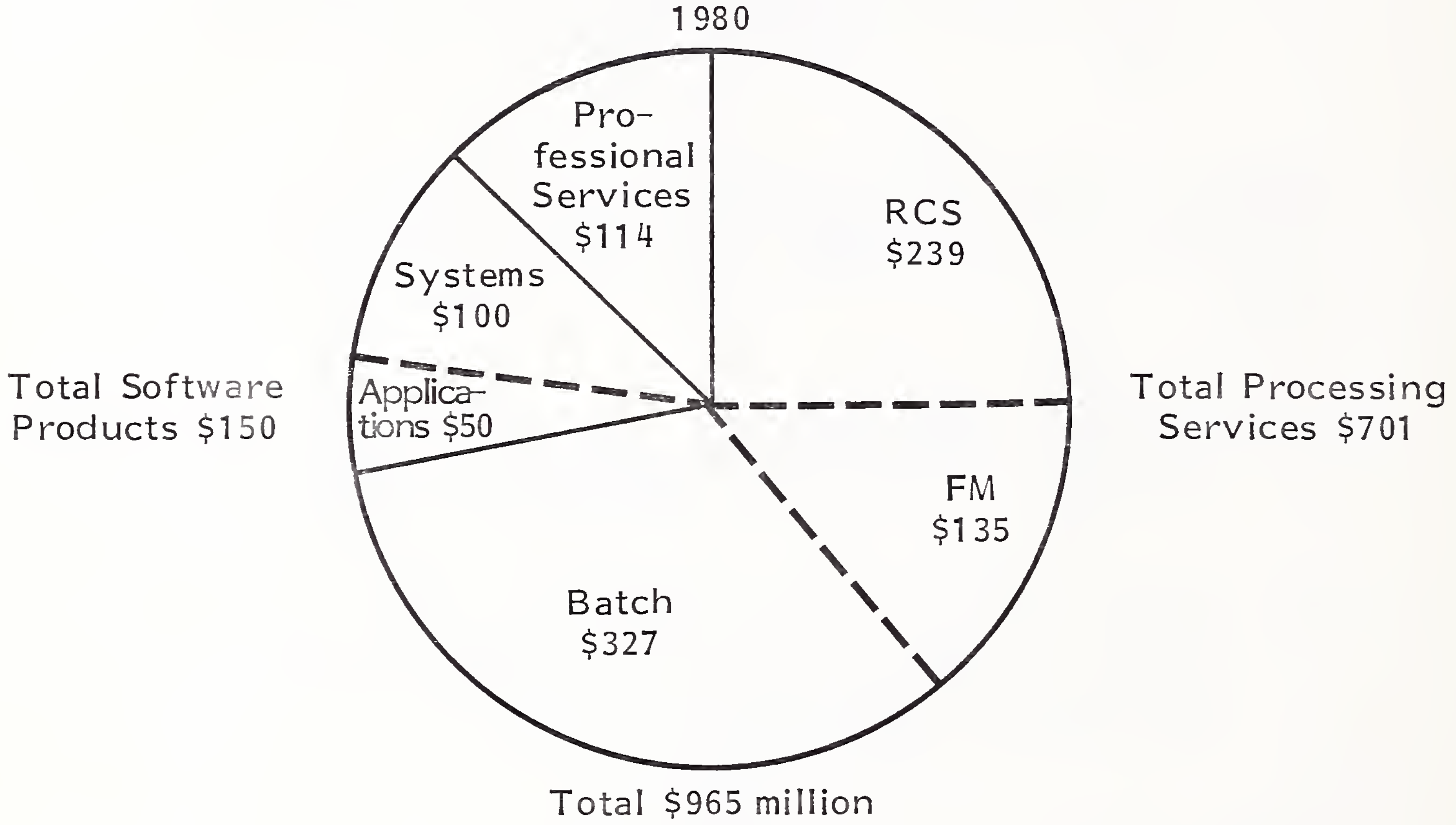
- Equally striking is the declining portion of DOD computer expenditures represented by hardware, as shown in Exhibit V-14.

  - While hardware accounts for almost half of 1980 embedded system expenditures, this will decline to under a quarter in 1986.

EXHIBIT V-10

FORECAST OF COMPUTER SERVICES IN ENERGY MARKETS BY MODE AND TYPE OF DELIVERY, 1980-1985

($ millions)



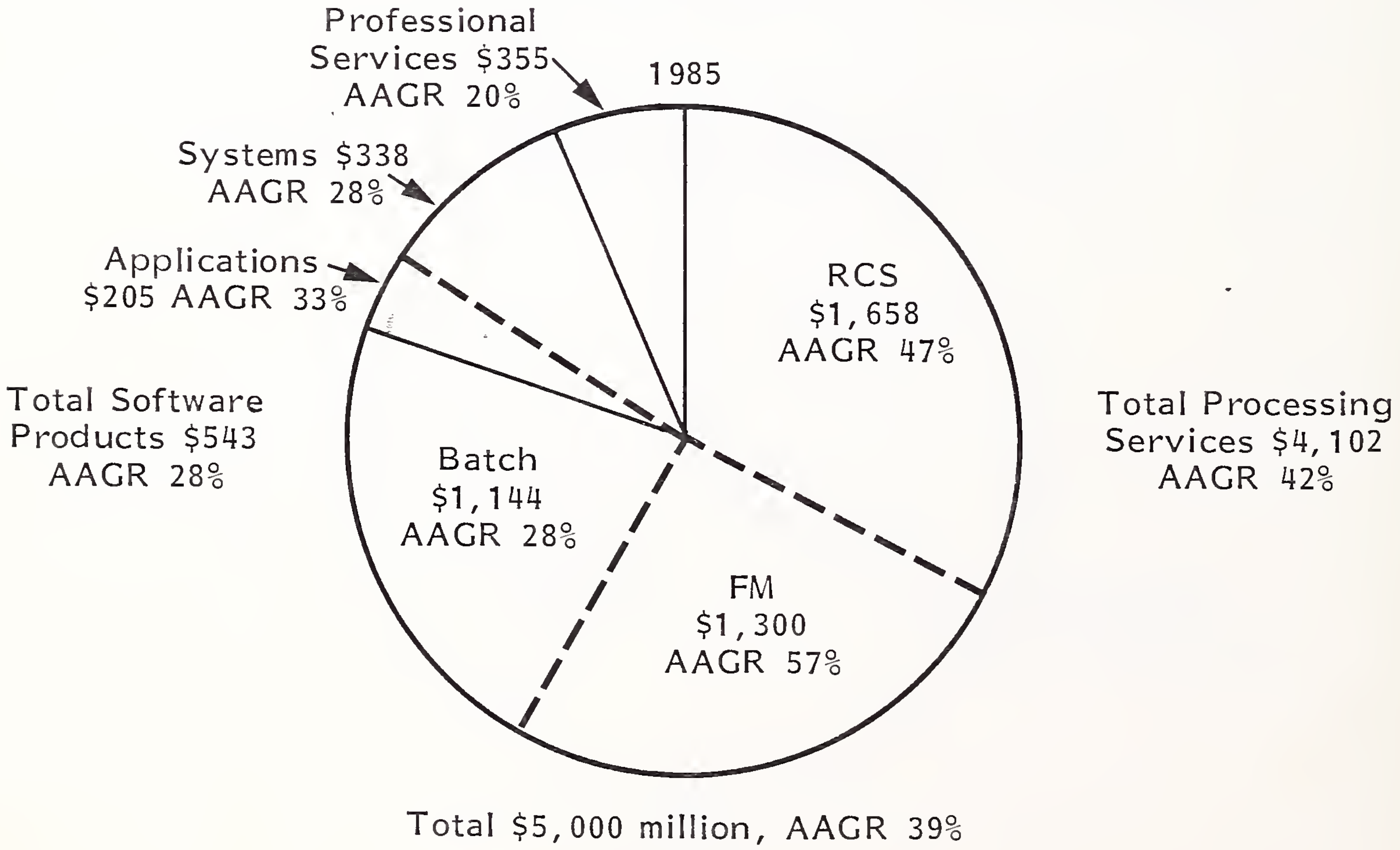


EXHIBIT V-11

FORECAST OF COMPUTER SERVICES EXPENDITURES BY ENERGY MARKET SUBSECTOR, 1980-1985

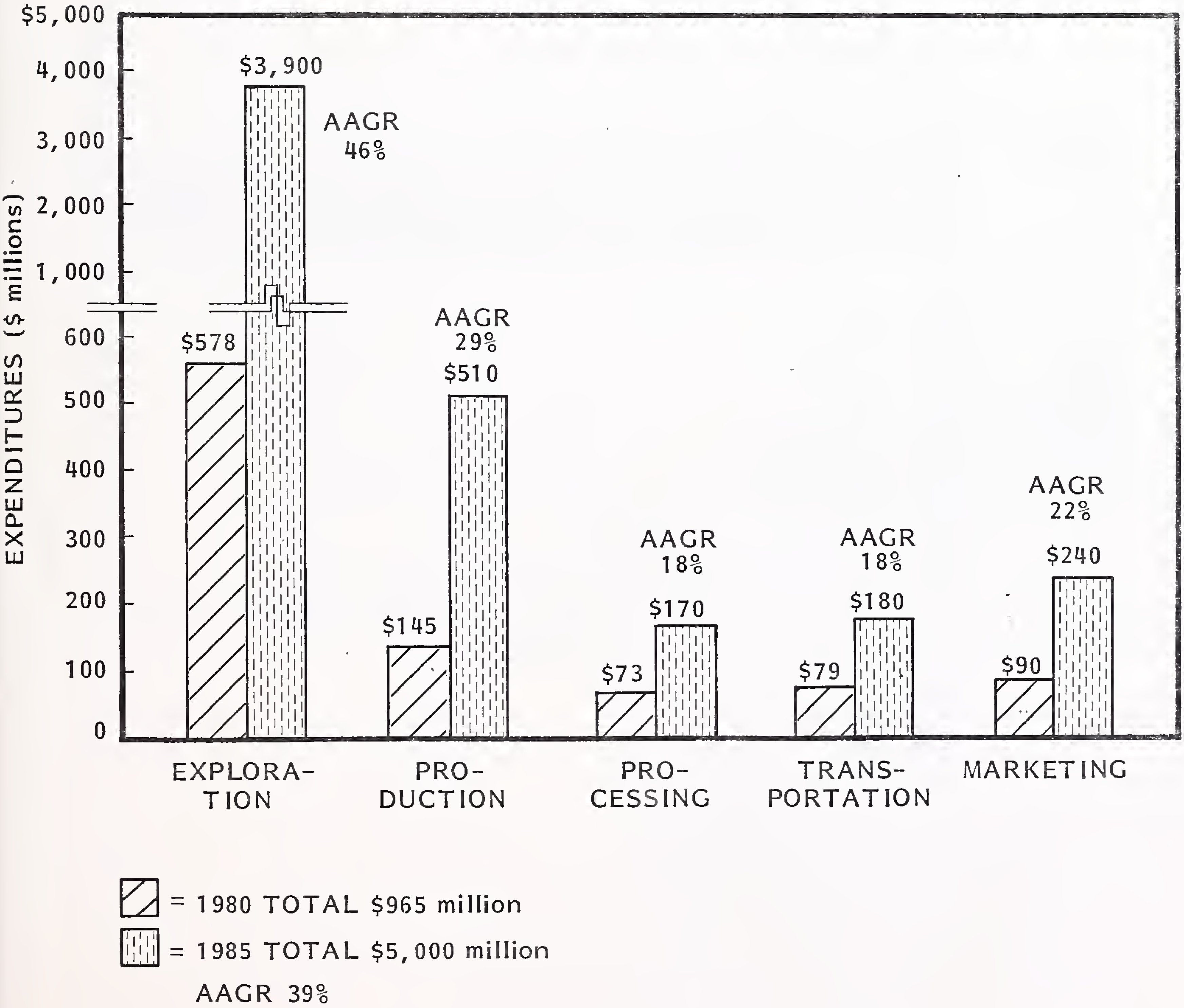


EXHIBIT V-12

1980-1986 DOD SOFTWARE AND SERVICES GROWTH: EMBEDDED AND ADP

(current $ billions)

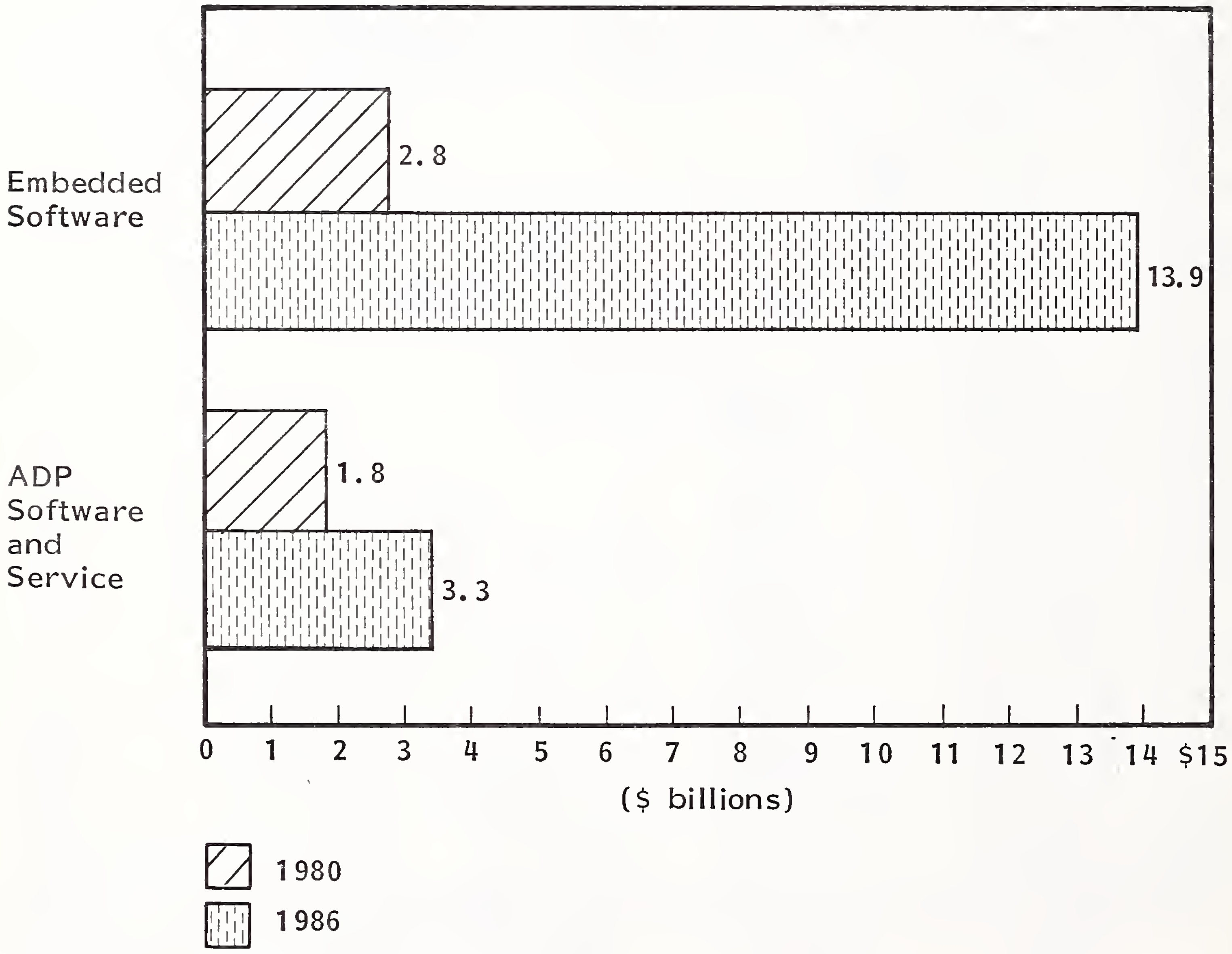
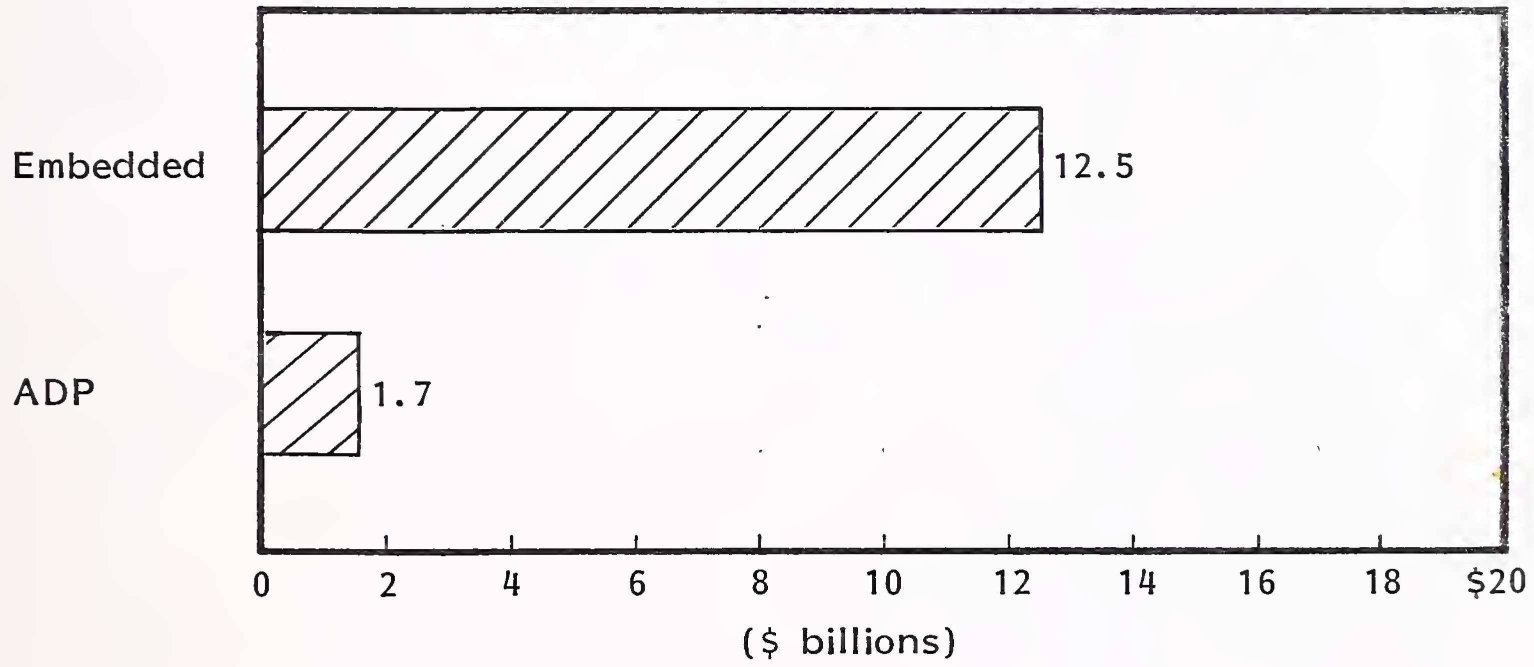


EXHIBIT V-13

ESTIMATED DOD CONTRACTOR MARKET FOR SOFTWARE AND SERVICES IN 1986: EMBEDDED AND ADP

(current $ billions)

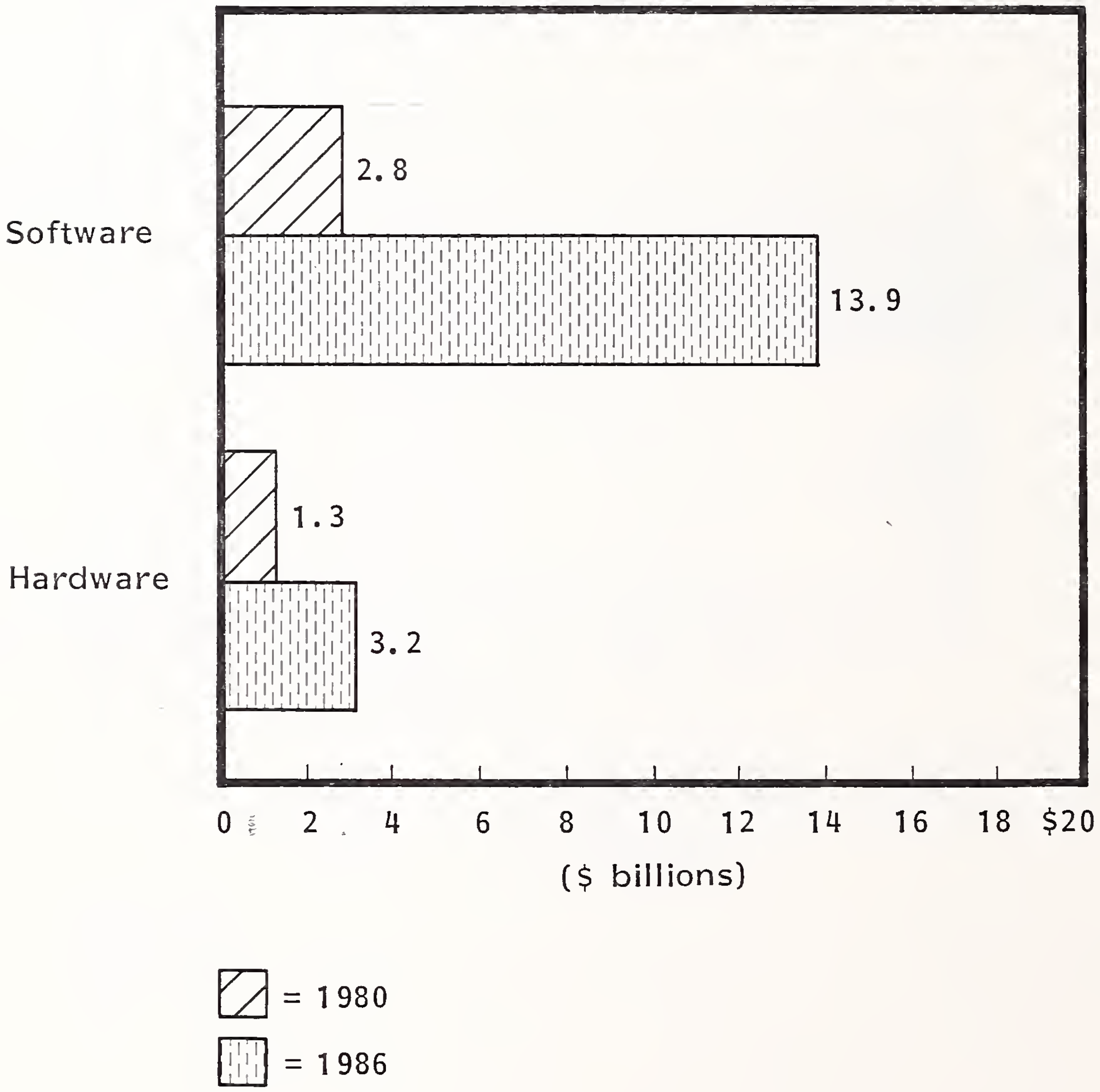


Source: INPUT Estimates

EXHIBIT V-14

1980-1986 EMBEDDED SYSTEM EXPENDITURES - HARDWARE AND SOFTWARE

(current $ billions)



VI CONCLUSIONS

VI CONCLUSIONS

- Looking forward, INPUT sees a number of causative factors that will have significant effects in the coming decade.

- The causative factors can be grouped under two headings:

  - Environmental.

  - Technical.

- These factors will have similar effects in both the commercial and military sectors.

- The causative factors will help to bring about or accelerate change in all areas; that is:

  - Software.

  - Professional services.

  - Processing services.

A. CAUSATIVE FACTORS

1. ENVIRONMENTAL

- There will be increased pressures to automate, in both the commercial and military sectors.
  - To improve performance while, hopefully, decreasing costs will be the driving force.
    - High and/or unpredictable energy costs and interest/inflation rates are basic economic forces at work.
- Changing relationships between centralized and decentralized areas will be the norm.
  - Many tactical decisions (in both the commercial and military sense) will be made in the field. Computerization is necessary to make this practical.
    - Military embedded software systems will be another aspect of this.
  - However, strategic decisions and overall control must still reside at a central point.
  - There is already considerable confusion on these points in many organizations and this confusion will grow, at least in the medium run.
  - One aspect of this is the move to work-at-home "cottage industries."
    - The software field itself is one where this could be an important factor by the end of this decade.

        - Personal computer systems are one cause/effect of this.

- Software, as it has developed in the past, has reached a dead end so far as quality and productivity are concerned.

    - Packaged solutions will be much in vogue; e.g.:

        - Commercial software packages for business/military ADP applications that can be at least semicustomized without giving up the advantages of replication.

        - Embedded systems for military applications.

    - In both cases, new software tools will be necessary for the developers of packaged solutions:

        - New languages (e.g., ADA).

        - New development methodologies (e.g., perhaps UNIX) that permit a software engineering approach.

    - The lack of sufficient numbers of qualified people will force acceptance of new solutions.

        - This personnel shortage will be even greater in the services, increasing opportunities for contractors.

    - The time and effort needed to develop reliable software have made it commercially attractive to enter markets by acquisition rather than internal development.

        - Acquisition costs have been rapidly escalating.

    - If software development becomes more engineering oriented, then the attractions of the acquisition mode will diminish.

2. TECHNICAL

- Improved computer processor price/performance is a given.
  - However, hardware cannot much longer make up for deficiencies in software, such as:
    - High development cost.
    - Lack of reliability.
    - Lack of flexibility.
    - Inability to solve the intended problem.
  - These are all very serious problems in the commercial sector. Military software must meet higher standards so is even more expensive.
- Cheap computer storage will open the doors to many types of applications.
  - DOD training should be an early market.
- There should be major communications cost reductions by 1990.
  - High-capacity coax/cable networks will be common.
  - Audio to digital technology will be implemented.
  - There will be information storage and processing capability in telecommunications networks.

- Standardized languages like ADA (or its follow-ons) will increase the amount of competition possible in DOD procurements by cutting the linkage between hardware and software.

B. MAJOR EFFECTS

(Note: Some of the effects were linked to specific causes above; these will only be summarized in this section.)

1. SOFTWARE

a. Current Issues

- There will be many new vendors/products, especially for small systems.
    - This will come about because there are few economies of scale in software production. (There may in fact be diseconomies of scale.)
- Hardware manufacturers will both compete with and support independent software companies.
    - This is a time of great flux in determining arrangements for producing and distributing software.
- The "hot" new software areas are:
    - Graphics integration.
    - Distributed processing.
    - Remote diagnostics and support.

- Productivity is a much talked of issue, but little has yet been accomplished.
  - Pressures are great for eventual change.
  - So far there is much less emphasis on quality.

- The industry is struggling over methods of distribution.
  - The evolution of software "manufacturers" and distributors is only beginning.
  - The entire marketing process is being reexamined since the current process is both expensive and inefficient.

b. Software Issues For The Remainder Of The Decade

- Packaged software, from the customer's standpoint, will look much more like today's custom and/or turnkey systems.
  - While appearing to be custom, it will be far more standardized and modularized than today's product.
  - Application programmers, as we now know them, will be obsolete.
    - Rather than a horde of semitrained bricklayers, there will be fewer, but highly skilled, architects.

- Software on a chip will be more common as solutions become more standardized and as code becomes more reliable.

- What are now considered embedded systems will be very common in everyday life.

- Hardware will often be "thrown in" with software, especially in semicustom applications where particular hardware may enhance a particular application.

- The evolution to being either a software manufacturer or distributor will be much further advanced.

  - The similarities between these distributors and other types of distributors will be quite pronounced.

2. PROFESSIONAL SERVICES

- Professional services firms will be forced to be on the leading edge of software productivity technology because of:

  - Costs.

  - Availability of people.

  - Quality pressures.

- Embedded software producers will be under similar, possibly greater, pressure because of DOD requirements.

- Professional services firms will evolve in several directions.

  - Those who build the building blocks.

  - Those who put the building blocks together.

  - Those who advise on the selection or use of systems.

3. PROCESSING SERVICES

- Pure processing will become increasingly rare, but will be sold in combination with other services.

- Processing services will be provided by many types of new entrants, such as:
  - Communications companies.
  - Broadcasting companies.
  - Publishers.
  - Computer manufacturers.
  - Banking/finance companies.
  - Processing services companies.
  - Non-information industry companies.
- In general, processing will be solution-oriented (or not survive).

C. GENERAL CONCLUSIONS

- Boundaries between the three classic subdivisions will fade over time.
  - Semicustomized, modularized software will blur the distinction between software, per se, and professional services.
  - There will be much more emphasis on specialized knowledge delivered either through a data base or consulting.
  - Processing services will evolve into value-added networks that may deliver software, processing, information, or consulting.

VII EVALUATION OF FACC OPPORTUNITIES

VII EVALUATION OF FACC OPPORTUNITIES

A. OVERVIEW

- The previous chapters showed that there are many opportunities in the software and services area. However, not all of them would be equally attractive to FACC.

- An evaluation of opportunities must:

    - Select logical opportunity areas.

    - Apply a set of judgmental criteria against each one.

- Exhibit VII-1 identifies four DOD opportunity areas.

- Exhibit VII-2 identifies five non-DOD (business and government) opportunity areas.

- Exhibit VII-3 lists 10 criteria that can be used to evaluate each opportunity area.

    - Each factor can be favorable or unfavorable.

EXHIBIT VII-1

FACC OPPORTUNITY AREAS:
DOD MARKET SEGMENTS

- DOD Embedded Software
- DOD Embedded Software Maintenance and Support Services
- DOD ADP Software (i.e., non-embedded), Made Up of
  - Packaged, Semicustom and Custom Software
- DOD ADP Software Maintenance and Support Services

EXHIBIT VII-2

FACC OPPORTUNITY AREAS:
NON-DOD MARKET SEGMENTS

- Business Software Packages
  - This Could Include Development and/or Marketing
- Personal Computer Software Packages
  - This Could Include Development and/or Marketing
- Business Custom Software
- Business Software Maintenance and Support Services
- Technical/Scientific Software

EXHIBIT VII-3

CRITERIA TO EVALUATE OPPORTUNITIES

- Quantitative Market Factors
  - Market Size
  - Growth Rate

- Qualitative Market Factors
  - Market Maturity
  - Receptivity to Vendor Products/Services

- Competitive Factors
  - Weakness of Competition
  - Ease of FACC Entry
    - Internal Growth
    - Joint Venture
    - Acquisition

- FACC Factors
  - FACC Product Knowledge
  - FACC Market Knowledge
  - Advantage of FACC Name

- Overall FACC Opportunity

  - Some are favorable or unfavorable to any entrant (e.g., market size).

  - Others apply specifically to FACC (e.g., FACC product knowledge/experience).

B. DESCRIPTION OF EVALUATION CRITERIA

- Each of the factors is briefly described and discussed below.

1. QUANTITATIVE MARKET FACTORS

- The market size is the 1980 size, in dollars.

  - A larger size is favorable.

  - In some cases (e.g., software maintenance) the market size is yet to be determined.

- The growth rate of a particular market is the projected 1980-1985 average annual growth rate.

  - A high growth rate is favorable.

2. QUALITATIVE MARKET FACTORS

- The maturity of a market can be generally typified as being in one of these stages:

  - Research.

  - Early use.

  - Take off.

  - Wide acceptance.

  - Decline.

  - The early take-off stage is the most favorable (assuming there will be an adequate-sized market).

  - The decline stage is usually to be avoided.

- Some market segments are more receptive to obtaining software products and services from vendors (e.g., DOD).

  - Other market segments have a bias in favor of in-house development (e.g., some large businesses).

  - These can change over time (e.g., business acceptance of software packages).

  - High receptivity is very favorable.

3. COMPETITIVE FACTORS

- If there is weakness in the competition, this is obviously a very favorable factor.

  - Very strong, entrenched vendors who already serve a market well could be an important factor in deciding against market entry or expansion.

  - Few segments have predominantly weak competition.

- FACC entry (or further entry) can be accomplished by:

- Internal growth.

- A joint venture or other contractual relationship (FACC may be either dominant or subordinate).

- Acquisition.

- The rating is an assessment of the feasibility of each means of entry.

4. FACC FACTORS

- These are factors which pertain solely to FACC characteristics and experience.

- FACC product knowledge can be gained from:

  - Experience of key people.

  - Past FACC activities.

  - Current FACC activities.

  - This may be related to means of entry (e.g., high FACC knowledge could make acquisition less necessary).

    - Very low knowledge might lead to other acquisition problems such as inability to communicate with, understand, or correctly manage acquisitions.

  - High knowledge is favorable.

- FACC market knowledge can be gained from:

  - Experience of key people; i.e.:

        - Previous jobs.
        - FACC contracts.
        - FACC sales activity.
    - Past and present FACC contracts.
    - Consultants.
    - This may also relate to means of entry; i.e., an acquisition may be necessary to gain market knowledge.
    - High knowledge is favorable.

- The advantage of the FACC name will vary:
    - There can be a considerable advantage with historic customers (e.g., DOD).
        - However, the name may be less valuable in new product areas.
    - There may be some advantage in dealing with other large customers.
        - There is often a "comfort" factor in dealing with another large organization.
        - Similarly, large organizations are viewed as having more stability.
    - This is unclear at the "retail" level (e.g., personal computer software).
    - To many potential customers, perceived expertise in an industry/technical area is most important.

        - That is, image.

    - The rating, given in the next section, is an assessment of the relative FACC impact on a market segment.

5. OVERALL FACC OPPORTUNITY

- This assessment takes into account all the above factors, but is not merely additive.

- An additive approach would have to assign weights to each factor.

    - Weights, whether formal or informal, will require more input from FACC management.

C. RATING OF SPECIFIC OPPORTUNITY AREAS

- For each area a matrix can be developed, applying the 10 criteria and assigning a rating of 1 to 5 to each (where 1 = unfavorable to FACC, and 5 = favorable to FACC). An example of the matrix is shown in Exhibit VII-4.

    - Ratings may be changed (either for particular factors or overall) by:

        - Additional data becoming available (e.g., on software maintenance from the study now being conducted for the Engineering and Technical Services Division).

        - Judgments made in related opportunity areas (e.g., a decision not to compete in the DOD ADP software market might impact entry into ADP software maintenance).

EXHIBIT VII-4

CRITERIA EVALUATION FORM

CRITERIA	RATING					COMMENTS
	UNFAVORABLE				FAVORABLE	
	1	2	3	4	5	
Quantitative Market Factors						
Market Size						
Growth Rate						
Qualitative Market Factors						
Market Maturity						
Receptivity to Vendor Products/Services						
Competitive Factors						
Weakness of Competition						
Ease of FACC Entry						
Internal Growth						
Joint Venture						
Acquisition						
FACC Factors						
FACC Product Knowledge						
FACC Market Knowledge						
Advantage of FACC Name						
Overall FACC Opportunity						

Rating: 1 = Unfavorable to FACC
5 = Favorable to FACC

    - FACC may wish to modify judgments made here (e.g., on FACC capabilities, where INPUT may not currently have a complete picture).

    - Certain factors being judged more important than others (i.e., weights being assigned).

- Exhibits VII-5 to VII-13 rate each opportunity area.

  - DOD embedded software emerges as the clear favorite, with most factors quite favorable.

  - DOD embedded software maintenance may also be promising, but several factors need resolution.

  - DOD ADP activities look somewhat less promising.

  - Technical and scientific software could be promising, but would represent, in large part, entry into unfamiliar markets.

  - Other business areas do not look promising at this time, largely due to their foreignness to FACC.

EXHIBIT VII-5

EVALUATION OF FACC ENTRY INTO DOD EMBEDDED SOFTWARE

CRITERIA	RATING					COMMENTS
	UNFAVORABLE				FAVORABLE	
	1	2	3	4	5	
Quantitative Market Factors						
Market Size					X	1980 = $2.5 Billion
Growth Rate					X	1980-1985 Annual Growth = 41%
Qualitative Market Factors						
Market Maturity				X		Stages = In Take Off
Receptivity to Vendor Products/Services					X	DOD Very High
Competitive Factors						
Weakness of Competition		X				Strong, Established Firms
Ease of FACC Entry						To Be Determened
Internal Growth				X		Have Base To Build On
Joint Venture			X			May Be Difficult To Find Suitable Firms
Acquisition			X			May Be Difficult To Find Suitable Firms
FACC Factors						
FACC Product Knowledge				X		In Transition To Software-Based Products
FACC Market Knowledge			X			In Transition To Software-Based Products
Advantage of FACC Name				X		In Transition To Software-Based Products
Overall FACC Opportunity					X	Core Of 1980s Business

EXHIBIT VII-6

EVALUATION OF FACC ENTRY INTO DOD EMBEDDED SOFTWARE MAINTENANCE

CRITERIA	RATING					COMMENTS
	UNFAVORABLE			FAVORABLE		
	1	2	3	4	5	
Quantitative Market Factors						
Market Size			X?			1980 Size = To Be Determined
Growth Rate				X?		1980-1985 Annual Growth = To Be Determined
Qualitative Market Factors						
Market Maturity					X	Stage = Take Off
Receptivity to Vendor Products/Services					X	DOD Very High
Competitive Factors						
Weakness of Competition						To Be Determined
Ease of FACC Entry						To Be Determened
Internal Growth			X			
Joint Venture			X			May Be Difficult To Find Suitable Firms
Acquisition			X			May Be Difficult To Find Suitable Firms
FACC Factors						
FACC Product Knowledge			X			
FACC Market Knowledge		X				
Advantage of FACC Name				X?		
Overall FACC Opportunity				X?		Follow-On To Embedded Software Development

EXHIBIT VII-7

EVALUATION OF FACC ENTRY INTO DOD ADP SOFTWARE

CRITERIA	RATING					COMMENTS
	UNFAVORABLE				FAVORABLE	
	1	2	3	4	5	
Quantitative Market Factors						
Market Size			X			1980 Size = $300 million
Growth Rate		X				1980-1985 Annual Growth = 12%
Qualitative Market Factors						
Market Maturity			X			Stage = Established
Receptivity to Vendor Products/Services			X			
Competitive Factors						
Weakness of Competition		X				Strong, Established Competition
Ease of FACC Entry						
Internal Growth		X				Little Application Knowledge
Joint Venture			X			FACC Marketing Contacts
Acquisition				X		Potential Good "Fit"
FACC Factors						
FACC Product Knowledge		X				Application Knowledge Required
FACC Market Knowledge			X			
Advantage of FACC Name				X		
Overall FACC Opportunity			X			Need Product Knowledge

EXHIBIT VII-8

EVALUATION OF FACC ENTRY INTO DOD ADP SOFTWARE MAINTENANCE

CRITERIA	RATING UNFAVORABLE 1	2	3	4	FAVORABLE 5	COMMENTS
Quantitative Market Factors						
Market Size			X?			1980 Size = To Be Determined
Growth Rate			X?			1980-1985 Annual Growth = To Be Determined
Qualitative Market Factors						
Market Maturity			X?			Stage = To Be Determined
Receptivity to Vendor Products/Services			X			
Competitive Factors						
Weakness of Competition		X				Strong, Established Companies
Ease of FACC Entry						
Internal Growth			X			Depends on Timing
Joint Venture				X		FACC Has Marketing Contacts
Acquisition			X			Depends on Timing
FACC Factors						
FACC Product Knowledge			X			Need More Application Knowledge
FACC Market Knowledge				X		
Advantage of FACC Name				X		
Overall FACC Opportunity			X			Probably Dependent On Approach Taken To DOD ADP Software Market

EXHIBIT VII-9

EVALUATION OF FACC ENTRY INTO TECHNICAL/SCIENTIFIC SOFTWARE
(CAD/CAM AND ENERGY)

CRITERIA	RATING UNFAVORABLE 1	2	3	4	FAVORABLE 5	COMMENTS
Quantitative Market Factors						
Market Size			X			1980 Size = $400 million
Growth Rate				X		1980-1985 Annual Growth = 37%
Qualitative Market Factors						
Market Maturity				X		Stage = Established / Many New Applications
Receptivity to Vendor Products/Services			X			Depends On Customer's Perceived Uniqueness
Competitive Factors						
Weakness of Competition		X				Many Established Firms
Ease of FACC Entry						
Internal Growth		X				FACC General Software Expertise
Joint Venture			X			FACC Would Bring In Expertise
Acquisition				X		Better "Fit" Than Business Software
FACC Factors						
FACC Product Knowledge			X			
FACC Market Knowledge	X					
Advantage of FACC Name			X			
Overall FACC Opportunity			X			

EXHIBIT VII-10

EVALUATION OF FACC ENTRY INTO BUSINESS SOFTWARE PACKAGES

CRITERIA	RATING					COMMENTS
	UNFAVORABLE				FAVORABLE	
	1	2	3	4	5	
Quantitative Market Factors						
Market Size					X	1980 Size = $2.7 billion
Growth Rate				X		1980-1985 Annual Growth = 33%
Qualitative Market Factors						
Market Maturity			X			Stage = Wide Acceptance
Receptivity to Vendor Products/Services			X			
Competitive Factors						
Weakness of Competition		X				Strongly Positioned Competition
Ease of FACC Entry						
Internal Growth	X					No Base To Grow On
Joint Venture		X				Marginal FACC Contribution
Acquisition			X			Potential "Fit" Problems
FACC Factors						
FACC Product Knowledge	X					
FACC Market Knowledge	X					
Advantage of FACC Name		X				
Overall FACC Opportunity		X				

EXHIBIT VII-11

EVALUATION OF FACC ENTRY INTO BUSINESS SOFTWARE MAINTENANCE

CRITERIA	RATING					COMMENTS
	UNFAVORABLE				FAVORABLE	
	1	2	3	4	5	
Quantitative Market Factors						
Market Size		X?				1980 Size = To Be Determined
Growth Rate				X?		1980-1985 Annual Growth = To Be Determined
Qualitative Market Factors						
Market Maturity				X		Stage = Probably Still In Early Take Off
Receptivity to Vendor Products/Services						To Be Determined
Competitive Factors						
Weakness of Competition			X			Part Of Professional Services
Ease of FACC Entry						
Internal Growth						Depends On Timing
Joint Venture			X			Depends On Timing
Acquisition			X			Depends On Timing
FACC Factors						
FACC Product Knowledge		X				Lack Of Application Background
FACC Market Knowledge	X					
Advantage of FACC Name			X			
Overall FACC Opportunity						To Be Determined

EXHIBIT VII-12

EVALUATION OF FACC ENTRY INTO CUSTOM BUSINESS SOFTWARE

CRITERIA	RATING UNFAVORABLE 1	2	3	4	FAVORABLE 5	COMMENTS
Quantitative Market Factors						
Market Size					X	1980 Size = $3.8 billion (Prof. Svs.)
Growth Rate				X		1980-1985 Annual Growth = 29%
Qualitative Market Factors						
Market Maturity			X			Stage = Wide Acceptance
Receptivity to Vendor Products/Services			X			High Cost / Variable Quality
Competitive Factors						
Weakness of Competition			X			Many Companies / Labor Intensive
Ease of FACC Entry						
Internal Growth	X					No Experience
Joint Venture		X				
Acquisition		X				Some "Fit" Problems
FACC Factors						
FACC Product Knowledge		X				Lack Application Knowledge
FACC Market Knowledge	X					
Advantage of FACC Name		X				No Business Image
Overall FACC Opportunity		X				

EXHIBIT VII-13

EVALUATION OF FACC ENTRY INTO PERSONAL COMPUTER SOFTWARE

CRITERIA	RATING UNFAVORABLE 1	2	3	4	FAVORABLE 5	COMMENTS
Quantitative Market Factors						
Market Size		X				1980 Size = $100 million
Growth Rate					X	1980-1985 Annual Growth = 60%
Qualitative Market Factors						
Market Maturity				X		Stage = Take Off
Receptivity to Vendor Products/Services				X		
Competitive Factors						
Weakness of Competition			X			Potential Leaders Emerging
Ease of FACC Entry						
Internal Growth	X					Little Experience In Applications
Joint Venture		X				
Acquisition		X				Candidates Small / "Fit" Problems
FACC Factors						
FACC Product Knowledge			X			Microprocessor Background
FACC Market Knowledge	X					
Advantage of FACC Name		X				
Overall FACC Opportunity		X				